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03 editorial

TONY SARNO

The market in Australia splits fairly evenly between the platforms

I'm always fascinated by the different reactions that we get from readers to our coverage of iOS and Android. The market in Australia splits fairly evenly between the platforms (roughly 42-44% each), with Android edging ahead only very slightly. Yet, based on reader feedback, every time we publish a story on either platform, it seems the market share of enthusiasm on our social media platforms is 90% Android, 10% iPhone and iPad. Why is that? I have a theory that those who buy an iPhone are looking for an appliance rather than a tiny computer. Appliance buyers want something that works seamlessly and isn't greatly improved by customisation because most of them simply aren't interested in tinkering with their iPhones. The iPhone 5 delivers this brilliantly as well as the necessary and important brand cachet. The iPhone 5 is still the best-engineered phone on the market (new Androids notwithstanding), with the best industrial design and style, most consistent navigation, the best app selection and regular OS updates in which no-one is left behind. In other words, it's the perfect consumer appliance phone.

On the other hand, Android (based on Linux) is much more reminiscent of the PC ecosystem. It's enormously powerful and customisable and available in endless handsets and versions. This is partly because of the massively fragmented ecosystem that powers it, in which everyone from individual phone makers to telcos are allowed by Google to tinker with it and add their own skins and bloatware. As a result, Android has an army of users intent on making their mark on it by customising, upgrading and extending it. It explains why stories about Android generate so much more response from *APC* readers than stories on Apple.

This is why in this issue we've decided to cover the process of rooting your Android phone on page 56 in great detail. When initially investigating this story, we discovered that the process of rooting your Android phone is covered on many web sites and YouTube, but the coverage is poor. Tutorials are often inconsistent or missing key bits of information that anyone attempting their first root would expect. So I assigned our heavyweight PC builder and engineer, Darren Yates, to the job. Darren is actually an Android enthusiast, but has so far kept to a more traditional role at *APC* – covering PCs. This is now changing. With our superguide on hacking Android, Darren brings the methodology and science to rooting Android phones that he employs when writing about the innards of PC technology. As a result, our guide is logical and easy to follow, and Darren will continue to cover the topic in future, giving you a consistency in professional Android coverage that's hard to find elsewhere.

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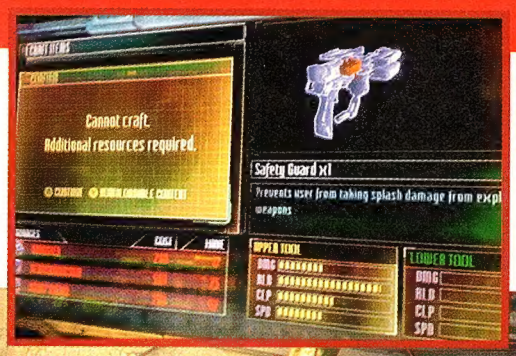

GAMES

IN-GAME TRANSACTIONS: EVIL?

The rise of in-game micro-transactions promises to change gaming... and max out our credit cards faster.

EA's announcement that it will add micro-transactions to more of its future games is the start of a new, more expensive era of gaming. Claiming that consumers are asking for micropayments, Electronic Arts CFO Blake Jorgensen recently said: "We're building into all of our games the ability to pay for things along the way, either to get to a higher level, to buy a new character, to buy a truck, a gun; whatever it may be".

The way in-game purchases have been implemented early on suggests the focus will be on making cashed-up players progress through various levels faster, but it seems almost inevitable that you'll eventually have to pay to simply get through a game.

Jorgensen's announcement caused a furore across gaming forums, so he appeared to backtrack later, claiming the community had misunderstood him and what he'd really meant was that micro-transactions would be part of all mobile games because these were largely based on the freemium model.

Nonetheless, EA does have micropayments in PC and console title *Dead Space 3*, in which you can pay to upgrade your weapons. When you don't have enough resources to pull together a new weapon, a message pops up saying: 'Cannot craft. Additional resources required.' These don't strictly require a payment as they can be picked up by the player, but they can be acquired quicker via a purchase from the in-game store.

Other big games with micro-transactions include *Mass Effect 3* and *Assassin's Creed 3*.

Eurogamer.net quotes *Dead Space 3* associate producer Yara Khoury as saying: "You can buy resources with real money, but scavenger bots can also give you the currency that you can use on the marketplace, so you don't *have* to spend [real-world] dollars".

Eurogamer also says that Khoury pointed out that you can't boost your way to the best weapons at the start of the game with cold, hard cash. "No you can't!" Khoury replied at the suggestion a player would be able to splurge money as soon as possible in exchange for the game's biggest gun. "There are a lot of weapon parts that are only available to buy later in the game", Khoury told Eurogamer.

While it's possible to complete *Dead Space 3* without spending anything via micro-transactions, EA's other games tell a different story. If you service your car in *Real Racing 3* on iOS and Android, for instance, you have to wait up to 40 precious real-world minutes before you can drive again – or you can spend a little cash to access it immediately. Micro-transactions have become a means of saving time, rather than enhancing your gaming experience.

But apart from bleeding you of cash subtly, micro-transactions also have the potential to distort game balance – the concept that tries to ensure the game's design doesn't give one player an unfair advantage over opponents. If one cashed-up player is able to pay for features and gear that gives him or her an advantage over opponents, then the game is being distorted. This could lead to two classes of players: those who pay for gear and those who have to toil for it. It could even lead to widespread class warfare in gaming circles, between impoverished gamers who need to labour hard to make progress against spoiled rich kids who just buy everything.

As more games with micro-transactions appear, you can also expect gamers to start offering a bit more resistance unless the games are also accompanied by significant price cuts.

APC staff & sources

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APC was there. Full report, page 20
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SECOND-GEN TABLET PCS

The tablet PC has established itself as a credible new addition to the laptop form factor. The most notable improvement has been the introduction of Centrino Mobile Technology, which has helped up the battery life. Our Editor's Choice tablet PC, the Toshiba Portégé M200, has good battery life at 185 minutes, although it's expensive at $4,290.

GPU MAKERS THINK LATERALLY

The hottest new graphics chipset this year won't come from Nvidia or ATI, but from lesser-known player XGI. Expected to land in Australia during the third quarter of the year, the XGI Volari will offer dual-processor rendering power with 512MB of GDDR2 RAM and up to 32Gbps of memory bandwidth.

THE SUPER DISCS

Next-gen laser tech is pushing optical media to new heights. The Blu-ray format is one of two top contenders and currently boasts 27GB per single disc layer or 50GB with dual layers. The rival HD DVD format specifies 15GB on a single-sided disc, with 32GB the goal for dual layers.

TABLET

SURFACE PRO HANDS ON

It's not yet available here, but Microsoft's Surface Pro brings PC power to tablets. Mary Branscombe explains.

We've been waiting for Microsoft's Surface Pro for an age now. And not just since it was officially announced last year or since Surface RT arrived three months ago. If you've ever played with a touchscreen Windows machine and wanted one that did the job properly, then Surface Pro and similar tablets reviewed on page 34 are your dream devices.

The Windows 8 Pro Surface didn't make our comparison in this issue because it's not yet available in Australia, although one of our partner magazines in the UK, *PC Format*, got its hands on one. It reveals that the Surface Pro is no bargain Android tab – it's a fully-fledged PC with a price tag to match (expected to sell for over $1,000 when it launches here).

The Surface Pro is best understood in context. While the Surface RT is a tablet for anyone who wants an iPad but needs to use Office and a keyboard, the Surface Pro promises you full laptop power in almost the same form. It has the same distinctive look, with that sleek black VaporMg case and the same full-size USB port, but it improves on the 10.6in touchscreen of the Surface RT with a higher resolution, and has some of the darkest blacks you'll find on *any* screen. Because there's no air gap between the layers of the screen – even with both touch and pen layers in there – the Surface Pro screen has true blacks and with very little glare. Turn it on and you get rich, vivid yet not over-saturated colours, as well as crisp, bright whites. Other screens look slightly grey, yellow or pink next to the Surface Pro's display and the full 1080p resolution is another welcome upgrade from the RT tablet.

Being able to tear off the cover and use the Surface Pro as a true tablet – albeit a slightly heavier one than most – is what sets this machine apart. This is also where the weight distribution matters most, and the battery isn't off to one side like it is in Samsung's Galaxy Tab 10.1, which can feel awkward to hold.

Compared to a mobile device with an ARM processor, the battery life of a PC with a Core i5 is always going to be comparatively disappointing. Initially, Microsoft said its Surface Pro would have half the battery life of the Surface RT – around five hours instead of 10. As usual, whether that's accurate depends on what you're doing. Our test is designed to hammer battery life and you're likely to be a little more reasonable with your demands.

This certainly isn't the thinnest, lightest, longest-lasting tablet you can get. It's thicker and heavier than an iPad or Surface RT, and it doesn't compete with either for battery life. But it's a real PC that can run any applications you throw at it, from Flash and Firefox to Photoshop and first-person shooters. Expectations are the real issue with the Microsoft Surface Pro. If you were hoping for something with the power of a Core i5 laptop, but the weight and battery life of a Surface RT, you need to take another look at the laws of physics and the current capabilities of Intel chips. APC

08 gadgets

JBL Micro Wireless speaker

Pocket-sized portable speakers are a real thing. A thing that people actually want, as the market is bloody flooded with them. Unfortunately, the sound output from most could generously be described as pretty crap. We do have hope that this new Bluetooth, battery-powered option from audio specialist JBL might be one of the better ones. They promise a palm-sized form factor, five-hour battery life and you can daisy-chain multiple units together to improve the acoustics. We've requested a sample and will let you know if they're ear-bleeding or ear-pleasing soon.

ONLINE www.ehifi.com.au

$69.95

TBC

Stinky Footboard

A bunch of French Canadian games are looking to take gaming foot control beyond *Dance Dance Revolution* with this ingeniously crazy controller. The Stinky Footboard connects to a Windows PC via USB and gives you four extra buttons that can be activated with just your foot. It uses a rocking mechanism so you need to tilt your foot forward, back, left or right to trigger a button. It even uses Cherry MX mechanical switches. Sounds good – after all, you can already use your feet for driving, drumming and, uh, 'erotic purposes', so why not add gaming to that list? Don't use it barefoot... unless you want it to really live up to its name.

ONLINE www.stinkyboard.com

The Mobile Blastmaster

If you want really outstanding portable audio performance and money is no barrier, consider The Mobile Blastmaster. After reading the specs list (Bluetooth audio streaming, built-in CD player and AM/FM radio, USB, 3.5mm audio) we couldn't help but be impressed by this 11-speaker, 2,000W, 100kg trolley speaker thingy. The makers claim it's good for 40 hours of playback, but you'll need to BYO batteries – it takes two 12V deep-cycle lead acid units. Yes, the same $300+ ones they use in cars and boats. Hey, if you wanna live large, you've gotta be prepared to spend large, too.

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Is the PlayStation 4 the future of the PC?

AMD wants to make better use of hardware with HSA. Matthew Bolton takes a look at the platform that looks suspiciously like what's in the PS4.

For a while, before the PlayStation 4 was announced, the rumour was that the new Sony console would be a thinly disguised PC. And that's broadly what it turned out to be, to the pleasure of some and the derision of others. But despite being on the business end of some customisation by Sony and AMD, it gives us a peek into the technology AMD hopes will be the future of general computing: HSA (Heterogeneous System Architecture).

HSA is an open standard, developed in part by AMD, which aims to create a highly efficient way of building systems, where CPU, GPU and RAM work together in unified harmony. AMD's been making APUs for a while, so the basic structure isn't new. Intel also combines CPU and GPU in its lines, and phones and tablets use all-in-one silicon exclusively – the new bit here is the aggressive integration of AMD's approach. It's planning nothing less than putting its latest CPU tech and Radeon Graphics Core Next GPU into a chip, and having a single volume of coherent unified RAM equally addressable by either component through a shared bus, without partitions or dedicated graphics memory.

Steam Boxes could end up as more open PS4s with AMD's tech.

SEAMLESS SHIFT

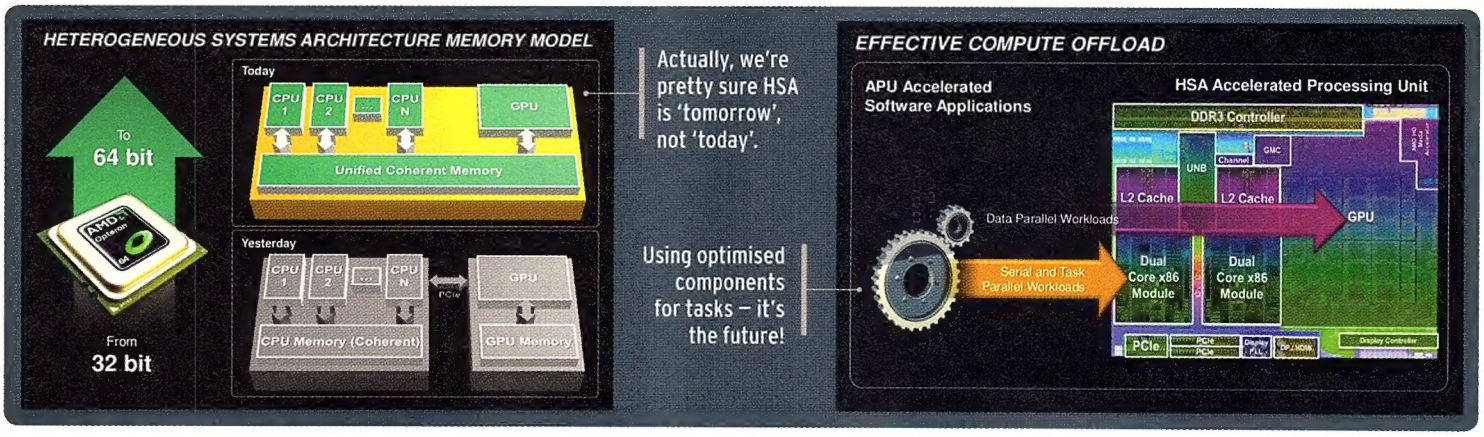
The idea behind HSA is to really start making use of every part of the system, seamlessly shifting tasks to the CPU or GPU depending on which works best. AMD's plan is to make the GPU easily available from within mainstream languages (C, C++, Python and more), making the GPU a true peer to the CPU for general computing and making the processes more efficient.

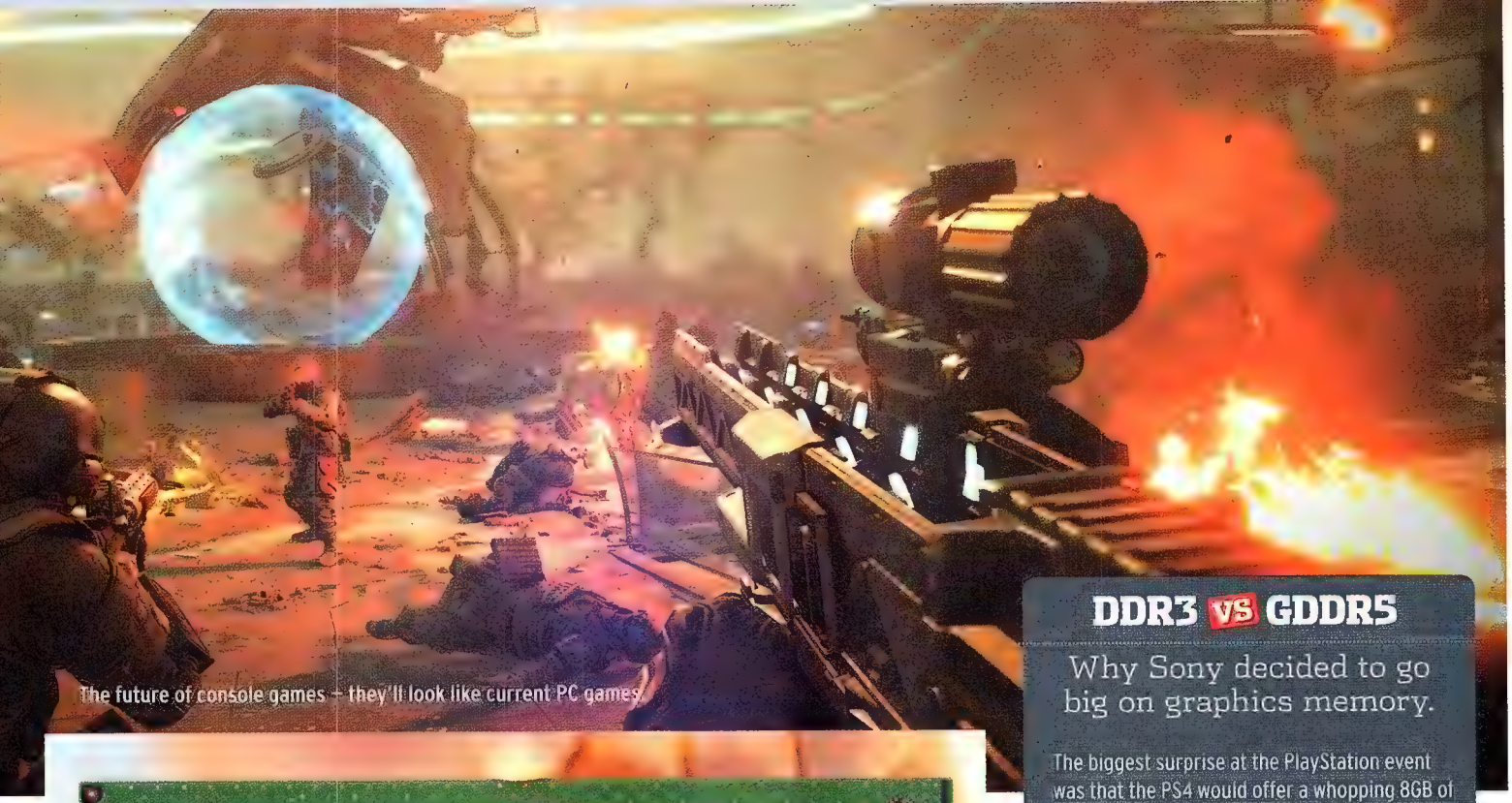
So far, so much good news for OpenCL/CUDA. The unified RAM is where things take the next step, with the HSA standard including coherent memory that either the CPU or GPU can cache to and reference through a shared high-speed bus. Software can switch between giving each component the workloads that it's most optimised to perform, without having to create memory copies. It's all designed to be simple, efficient and low-latency.

A pretty reasonable question at this point is to ask why AMD's bothering with pursuing this approach? Sasa Marinkovic, head of Desktop and Software Product Marketing at AMD, explained that AMD's vision for the technology is based largely on new ways of interaction: "What we are doing with HSA is preparing, so that the CPU can offload to the GPU and get tremendous performance leaps in new kinds of user interfaces."

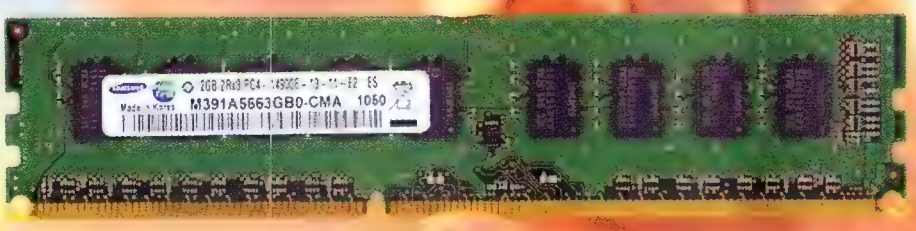
VITAL POWER

HSA should speed up gesture recognition, face tracking and live photo adjustments, for example. AMD seems to think making our computers respond to us instantly and more subtly is what's important for the future, including better power use. One of AMD's key areas to target with HSA is tablets. Here the space saving of a single-chip design is important, but power usage is even more vital.





The future of console games – they'll look like current PC games.



Even DDR4 RAM won't match the GDDR5 memory Sony's using.

Splitting tasks to the component that can complete them most efficiently means that overall power use can decrease, especially when combined with power improvements in the individual parts; AMD is introducing better idling tech in the GCN GPU, for example. For some tasks, AMD thinks HSA could drastically reduce power consumption.

While that's useful in laptops and tablets, AMD is cagier on HSA's role in desktops. A cynic might suggest that AMD is pushing HSA partly as an attempt to stop losing so much ground to Intel. Haswell is due this summer, with Broadwell taking Intel to 14nm next year. Meanwhile, Steamroller has slipped to a late 2013 release, if it makes it this year at all.

END USER EXPERIENCE

With HSA so focused on making it easy to start using the GPU for tasks, AMD is surely hoping that the performance deficit in its CPU lineup can be gently side-stepped by making better use of its graphics power pedigree.

Marinkovic insists it wasn't a case of trying to compete with Intel: "When you look at how people are using tablets, it's for things like web browsing that are GPU-accelerated, so these new workloads do play into our hands because we have industry-leading graphics. But the idea wasn't 'How are we going to compete with Intel?' – it was 'How are we going to get these amazing experiences to the end users?'"

Given that focus on experience, not raw power, and the fact that proper HSA support won't arrive until the end of 2013 at the earliest in the form of the Kaveri platform, you might be wondering what we can learn from the PS4. Drawing conclusions about performance would be rash, partly because of its custom design: an eight-core Jaguar CPU – the consumer version of this will be sold in quad-core configurations at most when it's released – and a GPU that's based on 'next-generation' Radeon tech and 8GB of unified GDDR5 memory. That last bit is the real eyebrow-raiser, but the rest is interesting because it's a tweaked version of Kabini, the low-power platform that will be the first APU to include GCN.

RUN ANYWHERE

AMD has said that the Kabini APU will offer very similar technology to what's in the PS4, but describes what's in the console as 'supercharged', adding that it also contains some Sony technology. But still, one of the core tenets of HSA is to reinvigorate the idea of 'code once, run anywhere' with standardised hardware and software implementations.

Marinkovic told us that the company can't comment on there being a straight line for converting from PS4 to its forthcoming APUs, but it's interesting to note that Nvidia's PhysX is still a major part of the PlayStation SDK.

It's too early to say whether this is a sign of the HSA-like architecture heralding a more platform-agnostic future, but when you take into account the numerous reports that the forthcoming Steam Box hardware is going to be based on very similar architecture to the Sony PS4, the idea of having all features on all platforms becomes more realistic, giving the PC platform a more unified future. BDC

DDR3 VS GDDR5

Why Sony decided to go big on graphics memory.

The biggest surprise at the PlayStation event was that the PS4 would offer a whopping 8GB of GDDR5 memory, unified between the CPU and GPU. For comparison, Nvidia's Titan graphics card offers a mere 6GB of GDDR5. It's a move that's costly as well as being quite difficult to fit into a console-like chassis, but it does make sense when you remember that the PS4 is a games machine first and foremost.

The advantage of GDDR5 over DDR3 is bandwidth – the PS4 will get 176GB/s out of its memory, which is a lot more than the 20GB/s or so from DDR3. Even DDR4 is only expected to double the transfer rates of DDR3. The flipside is latency. DDR3 is quicker to respond than GDDR5, even if the transfers are slower. This makes DDR3 better for general computing and GDDR5 better for shipping large amounts of parallel data in and out of the GPU. Funnily enough, that's how we use them now.

That's not an option in the world of HSA – it's one unified coherent memory to rule them all. GDDR5 makes sense then, because the PS4 isn't a PC. You'll mostly be in one game for a long time, where graphics performance is paramount, so giving the GPU the biggest pipe possible makes sense.

For Kabini and Kaveri, AMD will be sticking with DDR3. Marinkovic says it's the best balance with current CPU and GPU bottlenecks, and the performance that people need: "If we do need more workloads, it's an interesting option to explore," he added, feeding us hope for killer gaming tablets. "But at this point, DDR3 is delivering on the bandwidth and the capabilities that are needed."

There's also the cost factor, but AMD's focus on speeding up small tasks suggests that responsiveness will continue to be the priority over graphics. If these APUs end up being used in Steam Box hardware, we may see another custom GDDR-based solution. For now, don't expect to see this setup coming to a laptop anytime soon.

DOES REFRESH RATE MATTER?

Gordon Mah Ung pits a 60Hz panel against a 144Hz panel to see if hype over the higher spec is warranted.

We all know how the game is played when it comes to selling tech products: six cores are better than four, two GPUs are better than one and 1GHz is better than 500MHz. Besides the underlying pixel technology, monitors have really only been sold on either size or resolution – until now. In the last few years, manufacturers have begun marketing panels with more than double the refresh rate of a standard LCD. Rather than the 60Hz refresh rate, these new monitors push the refresh rate to 120Hz and even 144Hz. A high refresh rate promises smoother scrolling and less blur in games, but these qualities may not be for everyone.

Doubling the frame rate in *The Hobbit* from 24fps to 48fps, for example, is widely blamed for giving the movie its odd look, which turned off many viewers. (While refresh rate and frame rate aren't completely synonymous, they effectively produce the same result on the PC.) Is the same true of content on a high refresh rate PC monitor?

It's said that humans perceive reality at about 66fps. To find whether people prefer the effect of a high refresh rate or the familiar 60Hz experience, we set up two identical PCs, with a 60Hz panel hooked up to one and a 144Hz panel hooked up to the other. We then tasked a handful of test subjects to pick their pixel-pushing poison.

THE TESTING METHODOLOGY

For our tests, we built two nearly identical X79-based machines. Each was outfitted with a stock 3.6GHz Core i7-3820, 8GB of DDR3-1600, an OCZ Vertex 3 SSD and a GeForce GTX 580 card. Each machine was loaded with a clean install of Windows 8 and the identical Nvidia drivers were installed on both. We say 'nearly identical' PCs because the motherboards in our two boxes did differ. One featured an ASUS P9X79 WS and the other an ASUS Sabertooth X79 motherboard.

THE CONTENDERS

Representing the high refresh rate camp was ASUS's new 24in VG248QE. This is the first monitor to bring a 144Hz refresh rate to a consumer panel and is commonly found for a little less than $500. The 1,920 x 1,080 VG248QE is LED-backlit, with a rated 1ms

grey-to-grey response time and features an antiglare surface. The panel supports Nvidia's 3D Vision 2, but it doesn't ship with an emitter or 3D glasses to keep the price low.

As a gaming panel, the VG248QE also features a GamePlus feature, which displays a crosshair on the screen to 'circumvent' games that forego crosshairs when set to hardcore mode. Another mode displays a game timer for MMO players doing timed raids and RTS gamers running on a clock. The VG248QE is a TN panel, so folks with high colour accuracy needs should probably pass it up for IPS-like technology.

Representing the 60Hz field was an ASUS VN247. We considered pitting the 144Hz panel against a 60Hz IPS panel since the prices are similar, but in the end we decided gamers would be more interested in TN, given that tech's faster response time. The VN247 measures 24in and also features antiglare coating. It has a 1ms grey-to-grey response time and is rated at 250 nits. The VG248QE has a 350-nit rating, so we adjusted the brightness accordingly. Both were set to their 'theatre' preset, which we found to be fairly comparable upon visual inspection.

Since even the bezel of a monitor can influence people during image quality tests, we used cardboard to cover both bezels of the panels, as well as the PCs themselves, since we used different cases for each. We also used identical keyboards, mice and mouse pads for each machine, and audio was disabled on both.

THE TESTS

For our tests, we used three videos: the first was a 720p resolution video of an editor's commute, shot at 120fps with a GoPro HERO3 Black. The second video was a FRAPS-recorded session of *Left 4 Dead 2* running on a different 120Hz panel with VSync enabled, which locked the video down to 120fps. The third video was a 1080p HD MKV file at 24fps. This movie should have no bearing, as it's way below the refresh rates of both panels, but we wanted to see how our test subjects would react to it. We believed the videos would be the most difficult part of our test, but we wanted to see what people's eyes preferred.

For gaming, we used two Source Engine titles: *L4D2* and *Portal 2*. We decided on them because they'd comfortably exceed the refresh rate of both panels with the GeForce GTX 580 GPU in our systems.

For our final two tests, we asked the test subjects to scroll a web page as they would in real life and to move a window around the screen in their typical fashion.

To find out if high refresh rates are worth it, we tasked eight people to take our blind taste test.

It's not attractive, but by covering the bezels of both monitors, we could guard against bias.

THE INSTRUCTIONS

All of our test subjects were given the same instructions to weigh the smoothness of each monitor first and foremost. Subjects were also instructed to try to ignore colour saturation, black levels, contrast or colour temperature when picking the experience they preferred. The tester was careful not to suggest one panel over the other or to make approving or disapproving statements. Finally, all of the testing was conducted in a sealed and darkened room.

THE SURPRISING RESULTS

Our staff overwhelmingly preferred the 144Hz panel, but our test subjects didn't always agree. Before we get too far, we'll say that our preference is for the 144Hz or 120Hz panels. The overall smoothness, although unfamiliar at first, is something we quickly got used to. If we had to choose between a 60Hz TN panel and a 120/144Hz panel, the choice would be easy. However, the blind test subjects didn't see things quite as cut and dried.

THE CONSOLE GAMER

Our first test subject is a software and hardware reviewer. As we had expected, the video portion of our test was the most challenging and our subject had no preference in either of the high frame rate videos, but she preferred the 60Hz panel for the 24fps material.

As we moved onto gaming, she quickly latched onto the 144Hz panel, even saying the 60Hz panel is "tiring my eyes out" and "Owww, it's hard on my eyes". Moving on to what we thought was the easiest section, she surprised us by having no preference with the scrolling web page test. And in a further surprise to us, she picked the 60Hz panel in the moving window portion because the text stayed sharper.

THE SALESMAN

The second subject is a salesman who's also a gamer and PC enthusiast. He preferred the 120fps GoPro video on the 144Hz panel, saying: "This is more realistic". He had no preference in our high frame rate FRAPS video, and also preferred the 24fps material on the 60Hz panel. Interestingly,

REFRESH RATE RESULTS

Subject	1	2	3	4	5	6	7	8	Winner
Occupation	Console Gamer	Salesman	Hardware Editor	Tech Editor	Games Editor	IT Guy	Games Editor	Video Producer/Writer	
Glasses	No	Yes	No	Yes	No	No	Bionic	Yes	
Age/sex	31/Female	32/Male	34/Male	46/Male	23/Male	45/Male	38/Male	37/Male	
GoPro HERO3 Video 120fps	Neither	144Hz	144Hz	144Hz	144Hz	Neither	60Hz	144Hz	144Hz
Left 4 Dead 2 FRAPS Video 120fps	Neither	Neither	144Hz	Neither	60Hz	Neither	Neither	60Hz	60Hz
HD MKV Video 24fps	60Hz	60Hz	60Hz	60Hz	60Hz	Neither	60Hz	Neither	60Hz
Left 4 Dead 2	144Hz	60Hz	144Hz	Neither	60Hz	Neither	60Hz	60Hz	60Hz
Portal 2	144Hz	144Hz	144Hz	60Hz	144Hz	144Hz	144Hz	60Hz	144Hz
Scrolling test	60Hz	144Hz	144Hz	60Hz	Neither	144Hz	Neither	144Hz	144Hz
Window									
Moving test	60Hz	144Hz	144Hz	60Hz	Neither	144Hz	144Hz	144Hz	144Hz

the subject felt *L4D2* "felt smoother" on the 60Hz panel but then in *Portal 2* preferred the 144Hz panel. In our scrolling and window moving tests, he preferred the 144Hz panel.

THE GEARHEAD

Our third subject is a hardware editor. He was familiar with our challenge so we tried to throw him off by telling him we had swapped the monitor positions. He still picked the 144Hz panel for all of the tests save one: the HD source material at 24fps, which he said looked better on the 60Hz panel. Colour us cynical, but we suspect some confirmation bias at play, as his picks didn't actually mesh with others.

THE TECH EDITOR

Our next subject is a long-time hardware and tech editor. He immediately picked our 120fps GoPro video on the 144Hz panel and had no preference for our FRAPS video. Like the others, he picked the 60Hz panel for the 24fps HD movie.

In games, however, he had no preference in *L4D2* and preferred *Portal 2* on the 60Hz panel, saying: "It just looks sharper to me". He also preferred the 60Hz panel for both our scrolling test and moving window test, echoing our first test subject's reasons: sharper text, albeit at an admittedly lower frame rate.

THE PC GAMER

Our fifth subject, a junior games editor, chose the smooth rims of the wheels in our GoPro video at 144Hz versus the strobing on the 60Hz panel, had no preference on our FRAPS video and like all the others, picked the 60Hz panel for the 24fps material.

In games, he first picked the 60Hz panel saying: "This one definitely feels smoother," but then he reversed his preference in *Portal 2*: "[The 60Hz] is definitely smoother, but I'm liking *Portal 2* on [the 144Hz panel]." However, he described the differences between the two monitors in *Portal 2* as "miniscule." He also picked the 60Hz panel for both the scrolling and window movement tests, saying it was "smoother" for both.

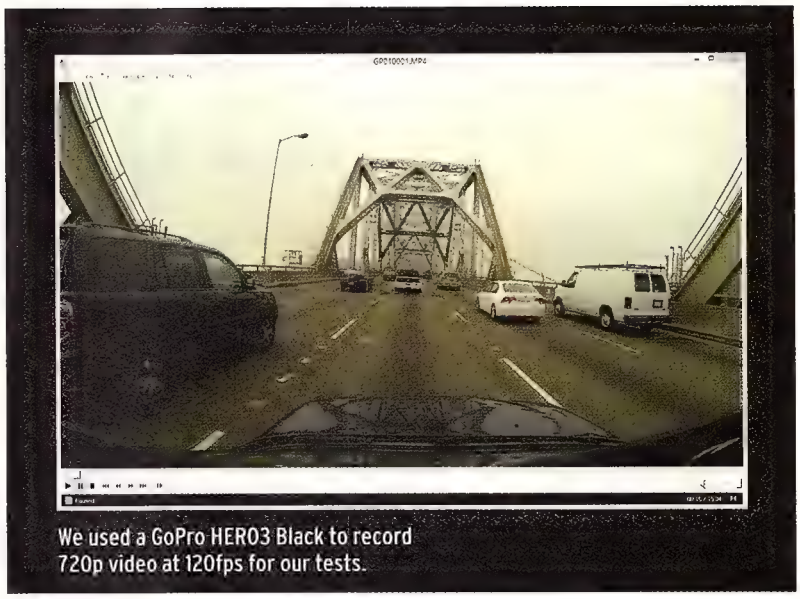
THE IT GUY

An IT guy served as our next subject. He had no preference whatsoever in any of our video tests or when playing *L4D2*. But he thought the 144Hz panel had a slight advantage in *Portal 2*. In our scrolling and window moving tests, he picked the 144Hz panel for both, saying the panel was "snappier".

GAMES EDITOR

We included a second gaming editor for his 'bionic-like' LASIK-corrected eyesight. However, he bucked our expectations by choosing the 60Hz panel in both our GoPro video and in the HD movie, believing the 60Hz panel was "sharper". In our *L4D2* test, he picked the 60Hz panel, even though he said he thought the 144Hz panel was actually "smoother".

When we got to *Portal 2*, however, he uttered "uh oh" and "oh, dear," as he realised which panel was actually 144Hz, which is the one he preferred in that test. He said the scrolling and window moving tests



We used a GoPro HERO3 Black to record 720p video at 120fps for our tests.

were both smoother on the 144Hz panel, but that he didn't care about those factors very much.

THE VIDEO PRODUCER

A self-proclaimed video nerd, this subject immediately keyed in on the differences between the panels. He picked the 144Hz panel for the GoPro video, calling it more "realistic" (albeit "wigging" to his eyes), although he preferred the 60Hz panel for the FRAPS video and had no preference for the 24fps material. In gaming, he could tell the difference between the two monitors, but actually chose the 60Hz panel because the motion blur felt more "comfortable" to his eyes. "This is like an old shoe," he said, even though intellectually he knew the other one was faster. He thought that scrolling on the 144Hz panel made it seem like the web page was on "grease" and while off-putting, he said he thought he could get used to it. "If you said I could take one home right now, I would take the high refresh rate monitor."

THE UPSHOT

When we tallied up the results, it was a closer contest than we expected. Rather than 144Hz being the clear choice technology, in many instances our subjects preferred the 60Hz 'look', even if they couldn't always articulate exactly why they liked it more.

Display expert Dr. Ray Soneira said some of our results aren't surprising. Video tests are particularly challenging when you're trying to display video at frame rates that don't divide into the refresh rate of the monitor. This creates artefacts that hurt the experience.

More puzzling to us is why the 144Hz panel was the preference with *Portal 2*, but not with *L4D2*, which is based on the same game engine. One theory is that *L4D2* takes on a too-smooth, 'plasticky' look (more so than *Portal 2*) when seen at high refresh rates and that puts people off.

Still, we're going to call this a win for the 144Hz monitor, but only by a hair. That said, our tests do show that it's certainly not the clear-cut choice for everyone.

epinions

HAVE YOUR SAY

APOLOGY FOR MICROSOFT APOLOGY

Microsoft's doing it wrong.

I hope you had your tongue firmly in your cheek when you wrote in your editorial last month (*APC* April, page 3) that you'd judged Microsoft too harshly after your constant questioning of Microsoft's Windows 8 strategy earlier. My reaction was that you lowered your standards by writing such a brown-nosing piece. Windows 8 is a two-headed usability camel that will, in time, go down in infamy. I was one of the unlucky ones who bought a laptop just after machines with Windows 8 started appearing on the shelves. Every day I try to like it and every day I end up thinking about how I could replace it with Windows 7. I am using the Classic Shell 'Start' menu, which does a pretty good job of replacing the missing 'Start' button, but even in the course of using the desktop 'app' in Win 8, I'm quite often shoved towards the Modern UI side, which tries to turn my desktop PC into a giant non-touchscreen tablet. Despite what you stated in your editorial, there is no vision here – just a heavy-handed corporate shepherding of loyal users into a direction that suits Microsoft's new business strategy, ie. a rip-off of the Apple model to make revenue from all apps that run on Windows 8. You should apologise for apologising to Microsoft.

Tim Williams

Editor replies: *Easy Tim, anyone who's read* APC *over the last year would appreciate that we have been extremely tough on Windows 8, to the point of being accused of being blatantly anti-Microsoft. But the reality is that Windows 8 is a very good operating system: it's leaner, faster and better than Windows 7 in many respects (we've documented these in previous issues) and that needs to be said, too, otherwise we're not doing our job of bringing our readers an objective view. But I also agree, Windows 8's Modern UI on a non-touch desktop does not add value. It's for tablets, hybrid and touch-enabled PCs, and until we're all using these it won't win any popularity contests.*

WINDOWS 8

What happened? You finally decided to remove the blinkers and actually tell the truth about Windows 8 – that it's the best Windows yet, with a 'Start' menu that's more extensive and modern than before. Your editorial last month probably saved you from losing me as a subscriber and I hope that your coverage of Windows 8 from now on is as fair as your editorial was last month.

Johnathan Reynolds

GET THE MAIN APPS

I should be paid millions for this, but I provide this valuable advice to Microsoft and BlackBerry's management about how to make their smartphone strategies successful, for free. Listen up Steve and Heins: you will not be successful until you have app stores that contain the most popular apps on the market. It's not about how many apps you have; it's about whether you have the *right* apps. As part of my job I was able to use a variety of smartphones, from iPhone to Android and recently the Nokia Lumia 920, which I loved until I realised that it did not have Instagram or a version of Evernote that's anything like the Android version, nor a version of Google Maps. My point here is that smartphone buyers increasingly come with baggage: their little app ecosystems. Instead of handing out cash to developers to create yet more apps, no-one's heard of, you should be paying the Instagrams of the world to create apps for your platform. I would gladly purchase your cool hardware with your cool operating systems, but I won't because you don't have the apps that I care about. It's not good enough to say you have native versions of Facebook and Twitter. Pick the top 20 apps in the App store and Google Play and pay to have native versions developed for your platforms. It's only then that your hardware and OS will have a shot at success.

Chris Wright

EPINIONS@APCTEST.COM Come on, have your say!

We want to hear what you think. Add to these discussions or email your views (in fewer than 250 words) to epinions@apctest.com. All correspondence becomes the property of *APC* and is subject to editing. Letters must include full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

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LIVE BY SOCIAL MEDIA, DIE BY SOCIAL MEDIA

A developer who publicly shamed fellow developers at a conference with a tweet has lost her job — yet another in an endless line of social media victims.

The 'big dongle' drama at a Python programming conference in Santa Clara, California, is just the latest in a depressingly neverending string of social media disasters. Two male programmers were cracking what they thought was a harmless joke about big dongles and forking someone's repo when a female programmer sitting just ahead of them objected. Adria Richards then made a terrible mistake: she decided to enlist Twitter to get her point across to the two men – and the world – by publicly shaming them. She turned around, photographed them with her phone and posted a note on Twitter with the conference #pycon hashtag in which she decried the 'sexual' nature of the jokes.

All hell broke loose. The conference organisers immediately picked up on the tweet and had security escort the two programmers out of the conference. If that wasn't enough humiliation for the two men, their employer, PlayHaven, makers of a mobile game sharing platform, then fired one of them. The unnamed programmer wrote an apology, but also argued that the 'sexual' innuendo referred to by Richards was mostly her imagination and that, with three kids to feed, he was out of work and devastated. When she'd overheard 'big dongle' he had been referring to a particularly large version of a device that plugs into a USB port to provide extra communications or security functionality for a computer. And when he'd said "I would fork that guy's repo", he claimed he was using a 'forking' analogy (forking is the process in software development when an executing process launches a new, separate one) to show his appreciation of a presenter's project.

Regardless, if Richards had been made uncomfortable by the conversation, she was definitely within her rights to object. But she naively believed that social media would take her side. As we've always said in 'End User', anyone who thinks they can manipulate social media for any reason, no matter how worthy, is a fool. Richards expected sympathy, but instead experienced the Twitter mob's rage. She was accused of overreacting and holding her own kangaroo court by photographing the men and posting a tweet that basically accused them of sexual harassment. One of the men in the picture claimed he wasn't even one of the two engaged in the conversation she found offensive.

Adria Richards
@adrianchards
Follow
Not cool. Jokes about forking repo's in a sexual way and "big" dongles. Right behind me #pycon pic.twitter.com/Hv1bkeOsYP
10:32 PM - 17 Mar 13
92 RETWEETS 90 FAVORITES

The tweet by Adria Richards that got her and one of the developer sacked. One of the men in the picture claims he was not part of the conversation.

A torrent of abuse was directed at Richards and hackers supporting the men decided to get even. They targeted not PlayHaven, the company that had sacked one of the men, but Adria Richards's own employer, SendGrid, a cloud-based email infrastructure provider, by launching denial of service (DoS) attacks against its web site.

But it got worse for Richards. Buckling under the social media pressure and the DoS attacks, SendGrid decided to fire her as well. CEO Jim Franklin said that while his company supported anyone's right to report inappropriate behaviour, he felt that Richards's decision to tweet the comments and photographs of the people who made the comments "crossed the line," adding: "Publicly shaming the offenders – and bystanders – was not the appropriate way to handle the situation. A SendGrid developer evangelist's responsibility is to build and strengthen our developer community across the globe. In light of the events over the last 48+ hours, it has become obvious that her actions have strongly divided the same community she was supposed to unite. As a result, she can no longer be effective in her role at SendGrid."

Wow. No winners here. Not the two developers, not Richards or SendGrid's apparent sacrificing of an employee due to pressure from the social media mob. abc

ENDUSER

Share the hilarity!

Do you work in the IT industry and are forced to deal with inept and clueless end users on a daily basis? Do you have an IT professional, who isn't that 'professional'? If you have an interesting or amusing story, email us at contact@apctest.com. All correspondence becomes the property of APC and is subject to editing. Letters must include the writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

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Available for and everything else.
Anyone still coming?!
Where are we headed?
Where is everyone??
Have we decided yet?
I give up, let's postpone this.
Can everyone please RSVP?
Hey, I'm only free on Friday
I give up, let's postpone this.
Is Tuesday lunch good for you?
Where are we meeting?
When do we meet up?
Need to make a choice.

CAMERA

INSIDE THE GOPRO HERO3

This month we delve inside GoPro's latest camera, the HERO3.

BACKGROUND

The compact, hands-free GoPro has become the go-to camera for adventurers who want to capture their outdoor exploits on video. This month, we get all up in the grille of the latest flagship model, the HERO3.

MAJOR TECH SPECS

- White/Silver/Black Editions with video resolution up to 1080p/30fps (white/silver) and 4K at 15fps in the Black Edition
- 5/11/12-megapixel camera with 3/10/30fps burst, respectively
- 1,050mAh rechargeable lithium ion battery
- Up to 64GB of external microSD storage
- Built-in Wi-Fi
- microUSB, microHDMI and microSD ports

KEY FINDINGS

- With the simple press of a button, the back cover is free, allowing access to a battery pull tab.
- A few clips and a little bit of adhesive hold the front cover in place, but that comes right off with a plastic opening tool.
- Four surprisingly long (8.1mm) T4 Torx screws hold the midframe in place and are easily removed. A little more prying, and the midframe and motherboard assembly practically fall off. Too easy.
- The image sensor, a Sony IMX117, pops off the motherboard assembly and can be replaced independently of the rest of the internal components.
- A daughterboard holds the microSD slot and a proprietary port used for a variety of GoPro accessories.
- Most components in the HERO3 use very little power and generate minimal heat. A light coating of thermal compound on the image processor is the most aggressive cooling feature in the device.
- A few more Phillips-head screws stand in the way of pulling out the glass lens.
- Because the display cable is adhered to the midframe, replacing the LCD requires the use of a heat gun.
- The entire device can be disassembled with readily available tools, and a modular design throughout allows the replacement of several individual components. apc

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GOOGLE'S CHROMEBOOKS FINALLY HIT AUSTRALIA

Dan Gardiner puts Acer and Samsung's new ultraportable Google laptops head to head, and asks whether the Chrome OS is a viable alternative to Windows or Mac.

We're living in an age with an almost confounding variety of options when it comes to choosing your tech. With a panoply of smartphones, tablets, all-in-one PCs, desktops, ultrabooks, desktop replacements, tablet hybrids and tablet convertibles to pick from, actually figuring out which combination best suit your own needs can be a tricky task.

If you're in that particular boat, we've got some good news and bad. While Google's local launch of its Chromebook line won't particularly help to calm that choppy sea of choice, these small and simple laptops do present an option that could, for some users, cater for all their basic needs at a very compelling price. In fact, is there anyone who wouldn't want a go-anywhere laptop for under $350?

A CLOUD-BASED OS?

If you're unfamiliar with the Chromebook concept, it's relatively simple. These are laptops that run Google's Linux-based Chrome OS, which has the Chrome web browser at its core, as the name suggests. As an OS, it's designed to cover your basic needs via Google's online services – Gmail for email, Drive for file storage, Docs for office functionality and so on, most of which are accessed through their standard web interfaces.

So while the OS itself lives on your laptop, you really need a web connection to use most of its functions – and obviously, being heavily invested in Google's cloud services won't hurt either.

If you're already a big user of the search giant's products then it's relatively easy to get started – just log in with your Google account and you'll have almost instant access to all your bits and pieces. If you're a Chrome browser user, it even automatically installs your extensions.

The Chrome OS isn't limited to just Google's services, however; you can, of course, access any other web-based apps you desire and there's also a range of third-party applications and games you can download via the Chrome Web Store. Plus, there's a basic file browser and media playback programs built into the Chrome OS itself.

All those pieces do help cover most basic computing tasks, but whether you can actually use a Chromebook ultimately boils down to one question: are you happy doing most of your computing through a web browser?

OFFLINE ACCESS

Given the cloud-based nature of Chrome OS's design, it's fair to ask what offline access is like. It's a bit of a mixed affair. We found that many games can be cached locally for offline access and your Google Drive contents can also be set up to sync to your Chromebook to allow for offline Docs access. (Buying a Chromebook also nets you 100GB of free Drive storage for two years via online redemption.) Email is a bit trickier and if you want to read old emails or draft new ones, you need to use a dedicated 'Offline Gmail' app, rather than the regular web-based one.

HARDWARE CHOICE

The first two Chromebooks available in Australia are the latest units built by Acer and Samsung, and with their compact form factors, 11.6in (1,366 x 768-pixel) screens and chiclet keyboards, they do look at least passingly similar on the surface. On the inside, though, they're actually radically different little beasts.

While the $299 Acer C710 runs on traditional x86 laptop hardware (a 1.1GHz Intel Celeron 847 CPU, 320GB hard drive and 2GB of RAM), Samsung has taken a rather different approach with its $349 Series 3 Chromebook, repurposing the ARM-based Exynos 5 architecture primarily used in the Korean giant's smartphones and tablets and putting it to work in a laptop. That means there's a dual-core Exynos chip running at 1.7GHz powering the show, combined with a 16GB SSD for storage, 2GB of RAM and a special ARM-based version of the Chrome OS.

Physically, that's allowed the Samsung unit to be a little slimmer and lighter, coming in at 1.1kg compared to the Acer's 1.3kg. It's also had quite an impact on battery life. Acer and Samsung rate their respective units at running for 4 hours and 6.5 hours, respectively, but we found the difference between the two was even more marked in our own testing. Playing back a standard-definition MP4 video, the Acer machine only lasted around half as long as the Samsung: 2:41hr compared to 5:27hr.

CHROMEBOOKS ON TEST

That said, the Samsung's great battery result does come at a slight cost to performance. While there are no real benchmarks for the Chrome OS, given that it's largely a cloud (and browser) based affair, we settled on using the web-based SunSpider and Peacekeeper browser benchmarks to assess each machine's performance. We've also included a Core i3-equipped Acer Aspire S3 in our performance tests to see what you can expect compared to a 'real' laptop.

In general, Acer's traditional x86 parts beat out Samsung's ARM kit when it comes to web browsing, by as much as 45% in JavaScript calculations. What better performance in the SunSpider and Peacekeeper tests essentially gives you is faster page loads and more multitasking

Acer C7 Chromebook

@ www.acer.com.au

✓ Ample storage space, pleasingly high-contrast screen, removable battery.

✗ Short battery life, a little heavy for its size.

Samsung Series 3 Chromebook

@ www.samsung.com/au

✓ Great battery life, lightweight and sleek design.

✗ Aussie price gouging, middling performance.

headroom – you'll be able to have more browser tabs open and run more intensive apps and games.

That said, in subjective use, we found both Chromebooks were close to each other in terms of overall responsiveness, and the difference in page load speeds wasn't so great that using the Samsung was a drag. On the other hand, the Acer Aspire S3 was noticeably faster and smoother than either unit in general use and the difference becomes more apparent when you start multitasking – open a couple of dozen tabs on the Core i3-powered Aspire S3 and it doesn't bat an eyelid, but on both the Chromebooks performance can get a little stuttery.

THE CAVEATS

Those performance limitations are somewhat to be expected, given the price, but it's worth pointing out some of the other shortcomings here, too. The Chrome OS can't access standard CIFS (aka SAMBA or Windows) network shares. In order to access files across a network, they need to be accessible via a web interface. That's something many network-attached storage boxes can provide, but if your home or office environment relies on access to network shares, this feature hole could be a deal-breaker.

Likewise, media playback capabilities are a bit mixed. There's support for common formats like MP3, Xvid and H.264, but some web favourites like MKV aren't recognised. While we generally had no problems with SD movies, both Chromebooks struggled with HD content. They played many YouTube 720p videos just fine, but when it came to our own rips (which are often higher bit rate), the results varied from mild frame rate issues to not playing a file at all. (You'll need to stick to SD MP4s or AVI files.)

PRICE CHECK?

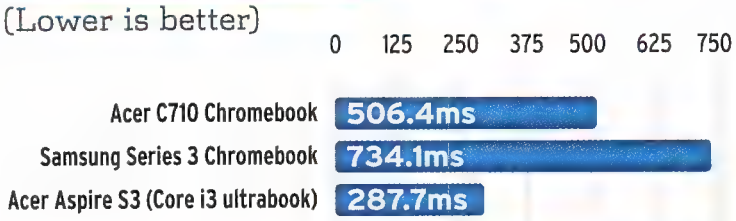
There's one last element that doesn't help the appeal either: both these machines sell for $100 less in the US – $199 for the Acer and $249 for the Samsung. At those prices, either unit would be an easy recommendation. On the other hand, it's not uncommon to see budget Windows laptops going for $400-$500 in Australia and the latter offer a lot more flexibility and performance than either of these Chromebooks.

If we had to pick between these two units, for us the Samsung's lower carry weight and longer battery life tip the scales in its favour, creating a unit that's more useful when you're on the road.

Those caveats do all ultimately add up, though, and the price in particular. These Chromebooks are certainly an interesting idea, but they're one that could presently still use a bit more polish. APC

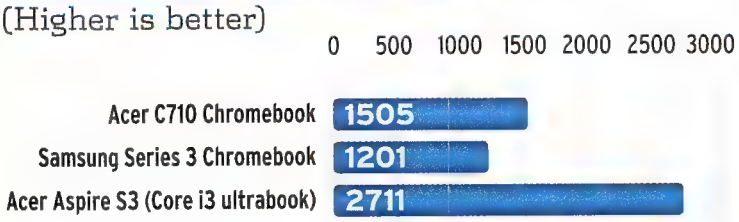
SUNSPIDER JAVASCRIPT BENCHMARK 0.9.1

(Lower is better)



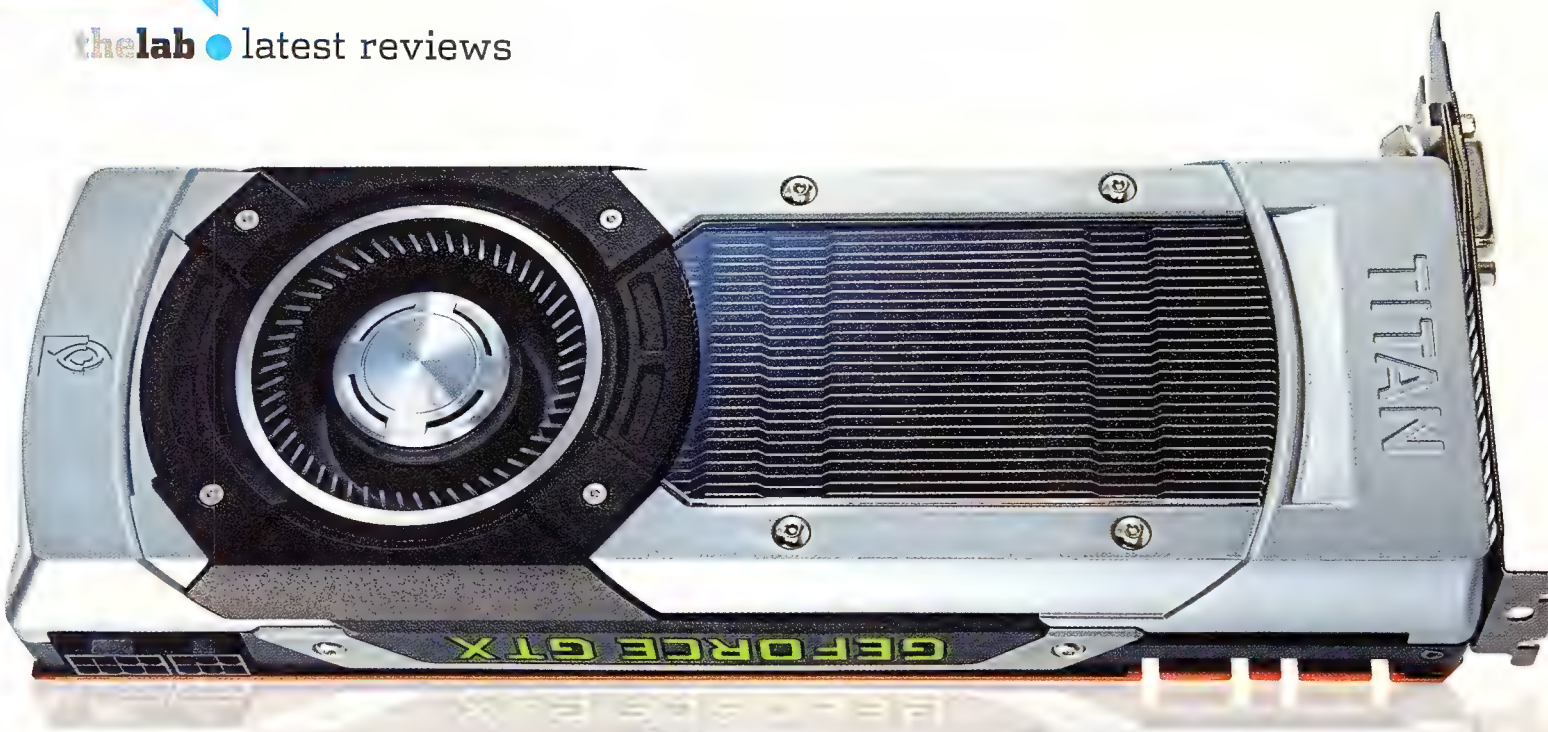
FUTUREMARK PEACEKEEPER BROWSER BENCHMARK

(Higher is better)



BATTERY LIFE TEST – SD VIDEO PLAYBACK

(Higher is better)



Nvidia GeForce GTX Titan

8/10

With a tag this high, price has almost become deliberately irrelevant.

GRAPHICS CARD

www.nvidia.com @

$1,300 $

The fastest single-GPU card around. ✔

Need we say it? Expensive. ✖

The Titan awoke at the end of October last year and benchmarking at 17.59 petaflops, it's the fastest of the current generation of supercomputers. Why would you want to know about a supercomputer when we're meant to be talking about a graphics card? Well, Nvidia supplied 18,688 Tesla K20 cards to pack out the Titan and in exchange, has nabbed the name to stick on its gaming-focused versions with the same GPU.

There was always the feeling that the GK104 GPU at the heart of the GTX 680 wasn't the fastest implementation of Nvidia's Kepler architecture, way back when we first got hold of our test unit in March of last year. That was confirmed a few months later when we saw those Tesla K20 professional cards, home to the full-fat Kepler core, the GK110.

The instant that card was confirmed, we were all taking bets on how long it would be before Nvidia took the plunge and dropped the GK110 into a proper gaming desktop card. None of us thought we would have to wait this long, at a time when we were expecting a new generation of graphics cards to hit.

AMD has announced it's sticking with the current range of HD 7000 cards right through 2013 and we're only likely to see a new lineup at the end of the year. With the launch of Nvidia's GTX Titan, I'd bet that the next line of GTX 700 series cards (based on the upcoming Maxwell chips) aren't going to land until the end of late Q3 at the earliest.

So, for the foreseeable future, this is the fastest single-GPU card around. However, it's not actually the fastest graphics card anyone's ever built; in fact, both the GeForce GTX 690 and Radeon HD 7990 we're putting it up against are faster cards out of the blocks. So is overall straight-line performance everything?

LOVELY BONES

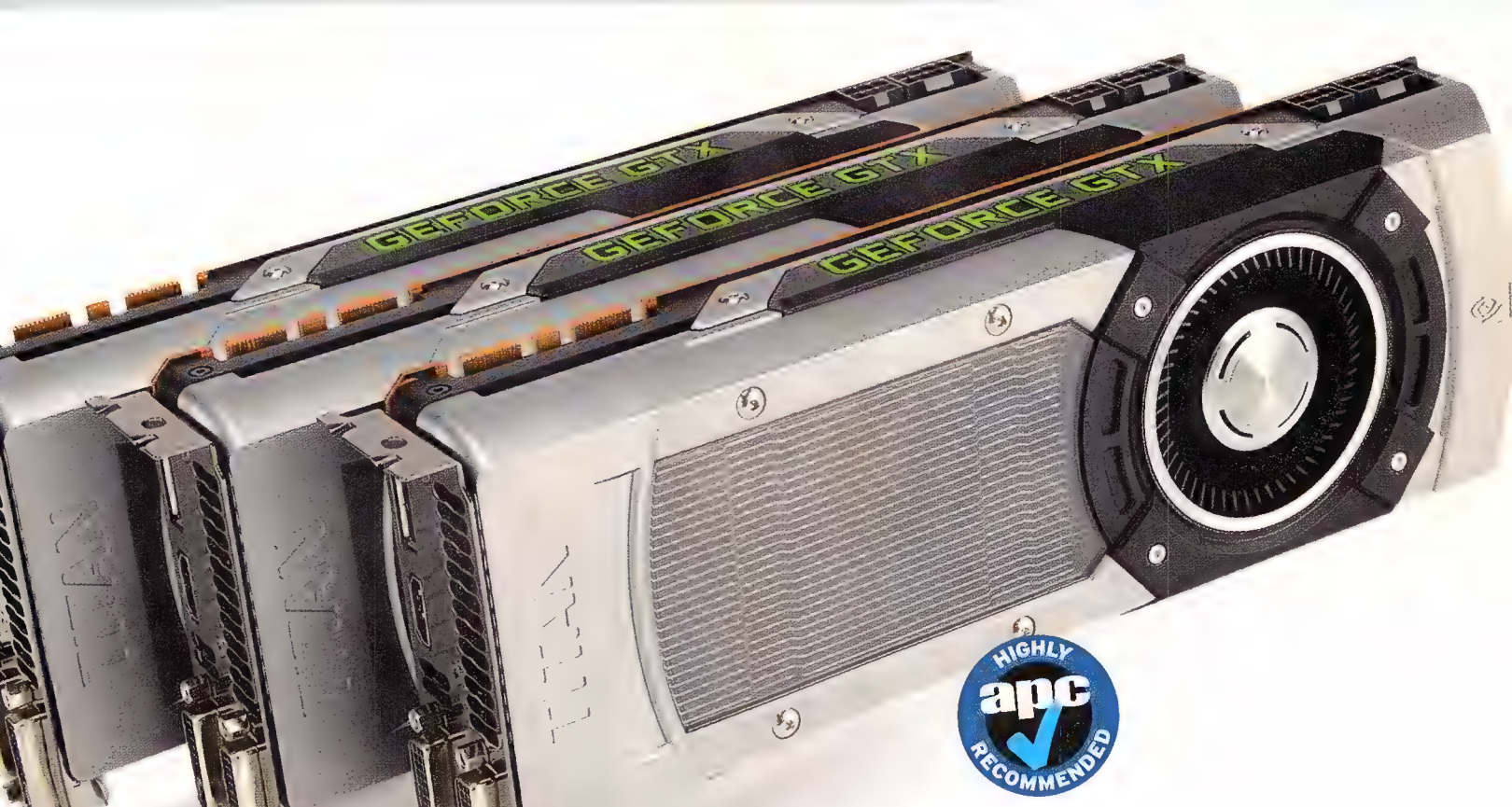
Before we get into any of that, let's take a look at what exactly is sitting inside that lovely magnesium alloy chassis. The big thing – and I mean that entirely literally – is the GK110 GPU. Sitting in the middle of the PCB is a vast chunk of silicon (520mm^2), with over 7 billion transistors.

Inside that silicon is the most complex graphics architecture around, with 2,688 single and 896 double-precision CUDA cores. Those are arrayed over 14 Nvidia streaming microprocessors (SMX), set in five graphics processing clusters. The fully-spec'd GK110 chip has 15 SMX units, but with yields giving more GPUs with 14 working SMX than with 15 SMX units, it was a product decision to ship with one shut down, although that's the same in the pro-grade Tesla K20X.

Coupled with those CUDA cores are 224 texture units and 48 ROPs. Those double-precision cores aren't enabled by default – you have to turn them on in the Nvidia control panel and what that does is it limits the base clock. It's recommended to keep them off when gaming and throw the switch only when you're going to be doing some serious compute-based grunt work. And with the Titan, the amateur 3D world is going to be rather excited.

With over 6GB of GDDR5, this thing is also capable of some incredibly high-resolution gaming. And that's arguably where this kind of 'ultra-enthusiast' card is targeted. With the new HD standard of 4K now on the collective radar, it makes sense for the top graphics cards of today to be ready for this new kind of image resolution revolution.

In terms of clocks, the GTX Titan is quite conservative, compared to the GHz GPUs we've become used to. Still, with



a boost clock of 876MHz it's no slouch, and with the advances made in the new iteration of GPU Boost, there's overclocking aplenty available for this card.

You're probably thinking that'll all require a massive PSU, yes? To be honest, power use is the biggest surprise of this GTX Titan package – it's got a TDP of just 250W. That's comparable with the TDP of the slower AMD Radeon HD 7970. This is all thanks to the power-conscious Kepler design and it means we were easily able to get a three-way SLI setup running comfortably on a 1,200W PSU.

SOFT SELLS

As with the GTX 680, the Titan isn't just about the hardware on the PCB – the software is almost as important. Just as GPU Boost was vital to the success of the GTX 680, so the new GPU Boost 2.0 is just as vital to the GTX Titan. In this second iteration, the focus that was placed on GPU power use has now been switched around, so the GPU clock is automatically boosted in line with the temperature the chip is running at. This means the software can be a lot more cavalier about the voltage it pushes through the chip; as such, it doesn't have to worry anymore about the combination of high voltage and high temperature.

In the original GPU Boost there was no overvolting. Nvidia imposed a hard limit on the amount of voltage you could push through to ensure this combination never hit, much to the consternation of the overclocking community. Nvidia's Tom Peterson explains it thusly: "When you have high temperatures and high voltage you blow up transistors. We are regulating based on temperature, so now we can have both high voltage and high temperatures being a possibility, but they never happen at the same time."

So now there's a higher standard voltage, as well as the option to opt in and allow overvolting within whichever overclocking software you choose. You can specify a temperature you want to hit as a limit, and the software will automatically adjust clock speed and voltage in an effort to boost the GPU as much as it can within that temperature limit. With this in mind, we were able to get up to around 1,175MHz, although that could be raised significantly with a quality water-cooling block.

ASPIRATIONS

What does that mean for performance? At a base level, that's actually quite tough to accurately measure. Each GTX Titan graphics card will perform slightly differently and that can be based on not just different GPUs, but also on varying environmental conditions. That said, our test card clock was happily topping the 1GHz mark without us even touching the overclocking controls. Sadly, that also meant that when we did start getting happy with the EVGA Precision Overclocking tools – and even after we stuck a 120Hz offset onto the base clock – we weren't really seeing much in the way of actual frame rate improvements.

We can comfortably confirm that the GTX Titan is the fastest single-GPU graphics card on the market, but it's not actually fast enough. For the most part, it's around a third faster than the preceding GTX 680 and in general, around 15 to 20% faster than a top-end HD 7970. There are a lot of variations compared with the Radeon silicon, with some game engines running 45% faster on the Titan. One in particular, *DiRT Showdown*, actually ran a couple of frames slower than the HD 7970.

The important thing is it's not even close to twice as fast, despite retailing at more than double the price of the GTX 680 or HD 7970. It also posts consistently lower benchmark scores than the oft-cheaper GTX 690 and HD 7990. I completely understand that this straight-line performance comes at a cost to your sanity – such is the way with multi-GPU solutions – but by all logic, the GTX Titan ought to be at least the same price as these faster cards, if not cheaper.

Nvidia isn't just looking to make a substantial profit by pricing its Titan at over $1,000, it's making a statement that this card is not for you. It's not really an enthusiast part at all – Nvidia is calling this new segment 'ultra-enthusiast'. The sort of person who's going to own this card is unlikely to even know it's there; they've got it as part of a custom-built PC, bought as a whole, with the proviso given to the system integrator that they want the best PC gaming experience on offer.

There's no doubt the Titan will offer a great PC gaming experience. It will run any game you throw at it at incredibly high resolutions, and it doesn't suffer from any of the vagaries of multi-GPU gaming to get you there. It's also very discrete, offering all that power without a huge demand on your PSU or eardrums.

But it's not an upgrade. You don't buy this card for your 24in screen gaming setup – or if you do, it's because you can't afford a Tesla K20 and have a penchant for 3D modelling. Mostly, you'll buy this as part of a premium system and you'll be very happy with it. It's a terrible shame that it's been priced out of the reach of most of us and it's sad to think this is the fastest single-GPU card we'll likely see for a year yet. But the Titan is still a slick, impressive feat of both design and engineering.

Dave James

7/10 ASUS VG248

A cheaper entry into the silky-smooth world of 144Hz gaming?

MONITOR

www.asus.com.au @

$469 $

Good colour representation, quick response rate ideal for 3D gaming. ✓

A little pricey. ✖

We should all be fairly grateful that monitor and TV manufacturers are now turning their attention and marketing budgets towards 4K panels. It means we can all accept that the latest attempt at making 3D a home experience was a total failure. However, since the 3D tide has receded, we've been left with some great panel technology for us faithful PC gamers – and that's been exemplified by the new ASUS VG range of 144Hz screens.

The enhanced refresh rate needed to get stereoscopic 3D off our PCs has led to some serious advances in TN technology. Now we're almost getting as good colour representation as we do with our favourite budget IPS panels and all that with a quicker response rate, which is perfect for those fast-paced 3D games. But it's still the 120-144Hz refresh rate that gets us the most excited about what the latest 3D movement has left behind.

This has meant that good, old TN panels with their quick refresh rates are actually rather pricey. In fact, you can pick up a decent 27in 10-bit IPS screen for around the same price as this ASUS TN screen. Suddenly, it becomes a bit of a head-scratcher as to which one you should go for.

ASUS's VG range of 3D screens have all been solid performers, offering the full Nvidia 3D Vision 2 experience with LightBoost technology to make the best of stereoscopic 3D's numerous failings. Outside of the 3D modes they're great monitors, offering a smooth desktop experience with a top-of-the-range 144Hz refresh rate and that excellent new spin on TN technology.

The Taiwanese company has also been smart in removing the built-in infra-red receiver and bundled 3D Vision goggles from most of its recent screens, such as the VG278HE. What this means is you'll no longer find yourself accidentally firing up *The Elder Scrolls V: Skyrim* with a hunk of plastic strapped to your face, filling your head with blistering headaches. Thankfully, ditching the goggles slashes a good chunk off the ticket price, too.

Unfortunately, the sad thing is that this 24in version still isn't much cheaper than the 27in one. We were hoping the smaller screen size would represent a more budget-oriented entry into the glorious new 144Hz world, although you're not saving that much. That said, you're still getting the same native resolution, full tilt and rotation, a VESA-compatible stand along with great image quality, but a sub-$400 price tag would have been nice.

We think most people will agree that a decent 120Hz to 144Hz screen is a rather desirable little gaming panel, minus forking out for an Nvidia 3D Vision bundle. However, while ASUS has got some impressive screen technology in its monitor range, it needs to get a lot more competitive on the price front given the value on offer from competitors at the moment.

Dave James

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PERFORMANCE NOTEBOOK

atomic hot award

PC & TECH AUTHORITY RECOMMENDED

VENOMCOMPUTERS.COM.AU

VENOM COMPUTERS EXCLUSIVELY AVAILABLE AT

mln.com.au

8
10

Gigabyte P2742G

Laptop l'orange.

LAPTOP

www.gigabyte.com.au @

$1,790 $

Attractive design, bright and clear display, good performance. ✔

Battery life could be longer. ✖

Gigabyte's P2742G is a bit of a showcase of the Taiwanese vendor's personality – both old and new. A 17.3in gaming laptop, this large desktop replacement boasts some fairly serious hardware. The spec list standouts? A 1080p screen, powerful Core i7 processor and a capable Nvidia GPU in the 2GB version of the GTX 660M. It's the sort of hardware we'd expect from enthusiast-friendly Gigabyte, offering solid performance for the laptop's price, even in demanding titles.

So where does the new Gigabyte come in? Well, despite being a large gaming machine, this laptop is actually easy on the eyes, from its consistent matte black finish and considered details, to the bright, clear and even display. Evidently the work done to kickstart Gigabyte's ultrabook and tablet designs has paid dividends across the vendor's product lines. On a surface level, we're certainly not complaining, least of all about the slick metallic cover finished in automotive orange.

Likewise, the rest of the hardware list – the stuff that's good for more than just gaming – also works for us. A 128GB SSD paired with a 1TB platter drive makes for speedy and fairly spacious storage, while HDMI out, an SD card slot, eSATA and a trio of USB 3.0 ports mean connectivity shouldn't be an issue. A Blu-ray combo drive rounds out the ins and outs, while a pair of speakers that are pretty good (by laptop standards) make for reasonably pleasing audio.

Looking deeper, the P2742G's hardware does the job. To put solid performance into perspective, this machine scored a good mid-range score of P2590 in 3DMark 11 and a strong PC Mark 7 showing of 4,401. In practical terms, that means we could run *Crysis 2* smoothly on this machine at the game's second highest detail settings, even at native 1080p resolution with DirectX 11 and high-resolution textures enabled. Less demanding games can be cranked all the way up; for example, *Street Fighter IV* runs at a consistent 60fps on this laptop with all the settings turned to 11.

That said, we did have some software issues. Like a few other Gigabyte machines we've had through our Labs lately, our review laptop refused to play nice with Valve's Steam game service, crashing the client every time we tried to run it. The Gigabyte reps we spoke to about this acknowledged that it's a known issue, but couldn't offer a working solution. There don't appear to be reports of similar issues popping up online, which makes us think this problem is limited to review units and their preloaded software; however, it's worth mentioning, especially on a gaming-focused laptop.

Also worth mentioning is battery life, which at 2.5 hours is good by desktop replacement standards, but still hardly conducive to all-day portability. Considering the low likelihood of this style of laptop being used away from a power source for long periods, that's hard to complain about, though. At 3.5kg, you're hardly going to be carrying this machine in your handbag.

Overall, we'd recommend Gigabyte's P2742G to buyers after a fast, good-looking gaming laptop for under $2,000.

Dominik Krupinski

7/10 BlackBerry Z10

Can the old king claw his way back in the smartphone era?

SMARTPHONE

au.blackberry.com @

$629 $

Fast browser, gestures easy to learn, great for info junkies. ✔

Camera is ordinary, lack of many consumer apps problematic. ✖

The first new BlackBerry in a long time is also the first to be running BlackBerry's OS 10. It's an entirely new code base running on a 4.2in 1,280 x 768-pixel (356ppi) touchscreen device. The Z10 proves how good OS 10 can be, with a button-free design that keeps a central information hub present at all times, so it's effortless to keep up to date with your email, SMS and social media networks. BlackBerry's famous for its keyboards and the OS 10 keyboard here works beautifully once you get the hang of its flick upwards autocomplete feature. There are downsides, though. App support is still limited at launch, with popular apps such as Instagram and WhatsApp notably absent. Old school BlackBerry fans may like the Z10's LTE speed, but the downside is that you no longer buy a BlackBerry service to go with the phone, which means no more unlimited browser internet – every session will count towards your quota. The camera's overall performance is ordinary compared to the better cameras found on Android or iOS models. The Z10 is certainly a solid phone. It's also nice to have another smartphone OS option and those who love having quick direct action to their messaging and social media will love the Hub features. However, up against the heavyweights of the iOS, Windows Phone and Android worlds, it falls short.

Alex Kidman

8/10 Sony Xperia Z

Sony goes for the premium market with its new flagship.

SMARTPHONE

www.sony.com.au @

$749 $

Premium construction, powerful, great camera ✔

Weird power nipple, terrible 4G battery life ✖

Sony hasn't had a truly stunning smartphone for a while, but the Xperia Z should qualify – at least on paper. It sports a 5in 1080p (441ppi) display on top of a 1.5GHz Snapdragon quad-core S4 processor and 2GB of RAM alongside an impressive 13MP camera that's also HD video-capable. It's 4G LTE 1,800MHz and NFC capable as well. It has a solid, understated design that's only slightly marred by an odd power button on the right-hand side. Every other connection hides behind a flap because the Xperia Z is both dust- and water-resistant. It scores well in Android benchmarks, managing 2,127 in GeekBench 2 and 6438 in Quadrant, and Sony wisely hasn't cluttered the design with lots of its own crapware either. The camera is generally very good, although the app can be slow to start up, even from the Android lock screen. So why don't we unreservedly love it? It's simply because the battery life is very poor. Sony tries to combat this with some aggressive power management utilities, but these generally work around turning off services when the screen is locked. That's fine if you don't mind waiting while it reconnects to a network to get all your emails, tweets, messages and other online tools. It's a pity as otherwise, this is a top-notch phone. If you're always in reach of a charger, it's a great buy; if you're truly mobile, you're going to have to switch off services or realise halfway through the day that your Xperia Z has gone completely flat.

Alex Kidman

9/10 Enermax ELC120-TA

An excellent water cooler at a great price.

COOLER

www.enermax.com @

$100 $

Offers excellent cooling, cools quicker than most. ✔

Somewhat pricey. ✖

Manufacturers making air coolers are throwing their weight behind closed-loop liquid CPU coolers. They're more effective, they're incredibly good value and are now a damn sight sexier than most ugly air coolers.

They're also the perfect cooler for cramped PC cases or those looking to overclock the crap out of their performance CPU. Higher clock speeds equal more leakage, with more excess heat to drag off the CPU package before the whole system shuts itself down. Water coolers are excellent at dealing with the high temperatures of overclocked CPUs and are incredibly quick at returning your CPU to its idle temperatures, compared with active air coolers.

The cooling performance of the ELC120-TA is every bit as good as the Cooler Master Seidon 120M and Corsair H100 we tested it against. In fact, in the overclocked CPU test, the Enermax ran around 1°C cooler than the Corsair. Where the latter has the real edge is in how quickly it returns the CPU to its idle temperatures after it's been run ragged.

The Cooler Master takes around twice as long to return the chip to its pre-ragged temperature, which in turn makes the ELC120-TA less than 50 seconds slower than the Corsair cooler. The Enermax comes with two 120mm fans, so it can drag more air across the radiator's fin stack; however, that's unlikely to explain the huge difference in peak to idle timing. Enermax also makes a 240mm version, with a radiator of the same size as the Corsair H100, and that should give it some stiff and chilly competition. As it is, this smaller chiller gives it a good run for its money and will also give you more chassis options. It might be better for some, especially if it can give almost the same level of cooling.

Dave James

7/10 Razer Black Widow Ultimate

The ultimate in mechanical switch keyboard design?

KEYBOARD

au.razerzone.com @

$150 $

Very solid build, responsive. ✔

Very loud. ✖

Last month we got all giddy over the DeathStalker Ultimate, a beautifully built keyboard with an excellent little trackpad/touchscreen in place of the numpad. It was a little buggy, but was so technically pleasing we couldn't help but fall in love with it a bit. Still, the price was daunting and it was using some rather dead-feeling membrane-switch key technology instead of the mechanical-switch tech we prefer. The Black Widow Ultimate comes in at around half the price of the DeathStalker and packs some swanky mechanical-switch keys to boot.

This is much more of a standard keyboard, so there are no fancy touchscreen shenanigans here. All you get as gaming extras are the five macro keys, individual LED backlighting and the ability to shut off the Windows key. It does, however, feel much more sturdily built than the relatively lightweight DeathStalker. There's no flex to the keyboard's chassis, built as it is from thick plastic. Despite the rather garish Razer-green backlight (it can be dialled back to a low level using the function keys), the actual design is relatively subtle and clean. The way the indicator lights appear, as if from nowhere, above the numpad is particularly neat.

We're not entirely taken with the mechanical switch keys Razer has used. It's far louder than any other board we've used, which could be annoying, and they also feel a little strange in the key action. That said, they're very responsive and survived our particularly rigorous *Trials 2* tests.

While we like the Black Widow's simple design, if Razer had used different switches on the keys we'd be weighing it up more favourably. So while it's a solid and responsive keyboard, it's not one we'd recommend, especially for $150.

Dave James

9/10 Corsair Vengeance M65

A super-sensitive upgrade to the Vengeance range.

MOUSE

www.corsair.com @

$75 $

Noticeably smoother than the M60 and at the same price. ✔

Sniper button is awkward to use. ✖

Corsair's range of peripherals just gets bigger and bigger, and it's now adding a new raft of updates to its Vengeance line of gaming goodies. We're big fans of the Vengeance range, from its excellent headsets and mechanical-switch keyboards to its rock-solid gaming mice, and now both the keyboards and rodents are getting a five added to their model names.

Starting with the Vengeance M65, you'd be forgiven for wondering what the fuss is about – Corsair has done nothing to change the design. It's shaped exactly like the original Vengeance M60, so it's built around a sturdy metal base, with adjustable weights and a simple, ergonomically designed moulded grip.

There's one headline change to the M65, though, and that's the fact that it's using a brand-new laser sensor in the base. Corsair is using the updated Avago LaserStream sensor – the ADNS-9800 – as opposed to the ADNS-9500 that was in the M60. That gives the M65 a top-end dpi setting of 8,200.

At the moment that's about as good as it gets for gaming sensors, and the Corsair software allows you to set the three dpi profile settings to any value between 50 and that top-end 8,200 mark. Like the M60, you also have access to different polling rates, from 125Hz to 1,000Hz, in the simple desktop app.

We love high-sensitivity mice, but even we find 8,200dpi a little too much for gaming. All it takes is a loud bang, your trigger hand twitches and you find yourself facing in the opposite direction. Drop down to 6,000dpi though, and we're happy. With the M60 running up to 5,700dpi with its older sensor then, why would you want to go for this upgraded version instead?

Well, this upgrade is hitting the streets for the same price, so you might as well go with the mouse that offers the higher headline specs if you've got an 8K screen and want to get from the taskbar up to the Recycle Bin in less than an hour. In reality, however, testing the two mice side by side you can see what the upgraded sensor is actually getting you. The new laser module is noticeably smoother than the one in the M60, translating your movements smoothly from the desktop to whatever gaming world you're in.

Personally speaking, the only issue I have with the M65 is a hangover from the original M60: the way I hold my mice means the sniper button (which instantly lowers the dpi for fine movements) is out of reach of my thumb. If I change grip, the forward and back buttons become awkward to reach. That's such a minor gripe I hesitate to mention it, but when you've got so many quality gaming mice available, there's little to choose between them.

Overall, the Vengeance M65 is a great addition to the Vengeance series and the gaming market as a whole.

Dave James

WINDOWS 8 TABLETS GET REAL

Forget Windows RT — if you want the full benefits of Microsoft's OS on a tablet, you'll need one of these true Windows 8 models. Bennett Ring tests five.

Windows 8 tablets promise to be the magical medicine to cure Microsoft's diminishing desktop sales woes. With consumers flocking to these ultraportable, ultra-simple devices, desktop PCs and even laptops have been struggling to remain relevant. Why buy a big box chained to the study when you can check your emails, Facebook and watch your favourite TV shows on a computer the size of a magazine?

Windows 8 is Microsoft's attempt to tap into the explosive popularity of these touch-controlled mega-mobile computers, strapping a new front end onto its Windows foundations. The first wave of devices were largely of the Windows 8 RT variety, limited to specially designed Windows 8 apps, thanks to their low-power ARM CPUs. Now we're seeing the arrival of true Windows 8 tablets, powered by the full force of Microsoft's favourite OS. With a healthy range of Windows 8 tablets now stocking store shelves, it's time to see whether they're the fix-all cure for Microsoft's ills, or yet another bitter pill for the Redmond-based software giant to swallow.

DESKTOP DISCRIMINATION

If you've yet to spread your greasy fingerprints across the screen of a tablet running Windows 8, you might not realise just how radically different the new front end is. Known as the 'Start' screen, it's a huge departure from the tiny icons and small buttons of the Windows desktop, with large slabs of colour representing each application. Opening any Windows 8 application reveals oversized interfaces and it's all designed to be easy to operate with stubby digits, which lack the pixel-perfect precision of a mouse pointer. This is an interface built with the intention of touch control, a feature that every Windows 8 tablet includes, courtesy of their touchscreens. Try using it with a mouse and it's a somewhat inefficient affair. Use your fingers, though, and flicking through apps and web pages on a tablet feels rather like browsing through the pages of a magazine, mimicking many of the gestures used with their printed-paper cousins.

The sleep and fast boot features are also designed entirely with tablets in mind, allowing users to access their mobile computer almost

instantly – a far cry from the minute or two PC owners normally use to make a coffee while their desktop PC boots. After spending several months with Windows 8 on both the desktop and tablet, it's obvious to us that it's designed for the latter, but the handful of features that make it worthwhile upgrade for desktop and tablet users.

THE DOUBLE-EDGED DESKTOP

There's one problem with Windows 8 tablets: the old desktop environment. This is Windows 8's greatest strength compared to the simpler Windows 8 Modern UI, but is also its greatest weakness. There's not a lot of software designed for the Windows 8 touch-centric front end yet, so being able to run the millions of existing Windows-based programs via the desktop is a godsend for those who need to do more than tweet from their tablet. Sadly, using these legacy programs on a full-blown Windows 8 tablet without a mouse is a fiddly and frustrating affair.

Microsoft simply hasn't done enough work to make the desktop mode finger-friendly, but there is hope yet. Most tablets also come with a keyboard and the few that ship with a stylus can avoid the problem entirely. It still feels like you're working with a slightly schizophrenic operating system when switching from the 'Start' screen back to the desktop, but as more Windows 8 apps are released, this will hopefully become less of a problem.

TESTING THE TABLETS

We put five of the newest Windows 8 tablets on the market through the wringer, from slim-line budget models to the fattest premium tablets money can buy. One tablet we couldn't test was Microsoft's higher-end Windows 8 tablet, the Surface Pro, as it's still mysteriously AWOL from Australian shores. Based on the mixed feedback it's received overseas, its absence isn't perhaps a huge loss.

GENERAL PERFORMANCE – PCMARK 7

	Score
Samsung ATIV Smart PC Pro	3,476
ASUS VivoTab Smart	1,408
Acer ICONIA W700	4,442
Lenovo ThinkPad Tablet 2	1,442
HP ENVY x2	1,434

BATTERY LIFE TEST – POWERMARK (BALANCED)

	Score
Samsung ATIV Smart PC Pro	4:17hr
ASUS VivoTab Smart	Did not finish
Acer ICONIA W700	4:39hr
Lenovo ThinkPad Tablet 2	8:09hr
HP ENVY x2	5:23hr

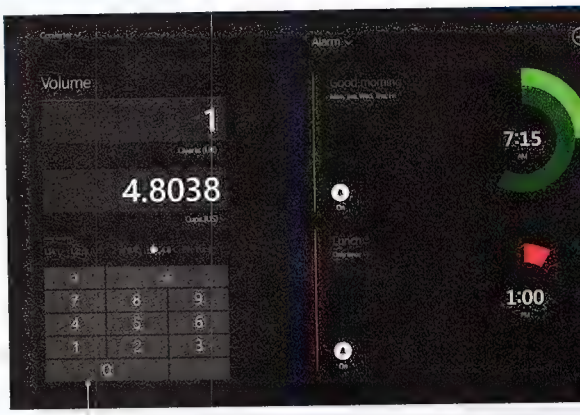
BLUE MAKES WINDOWS 8 BETTER

Microsoft is already working on a significant update to Windows 8. Dan Gardiner reveals what to expect.

As good as Windows 8 is on a tablet, there's undoubtedly still room for improvement. Microsoft hasn't just been sitting idly since the OS was released last October and has been diligently working on the first major update, codenamed Windows Blue, which aims to further refine and polish the OS.

Details have thus far been scant about what exactly Blue contains, but the leak of an alpha build to the web in late March, which *APC* summarily got hold of and tested, has shed a little more light on the topic.

If you were expecting Blue to make radical changes (like bringing back the classic 'Start' menu), you're likely in for some disappointment. Based on the alpha, Blue seems to be primarily focused on improving the Modern UI side of things, adding and improving features to make it more flexible and user friendly, and giving you less reason to need the old desktop interface if you're using a touch-based device like a tablet.



Blue includes a sprinkling of new touch-friendly apps, including a calculator and alarm app.

There's more customisation options for the Modern UI, such as the ability to shrink tiles or ginormify the Desktop shortcut.

This includes some UI refinements, like letting you resize the Modern UI's tile-based shortcuts to make them smaller (or in the case of the 'Desktop' tile, much bigger) as well as more flexible app snapping. The latter feature already exists in Windows 8 and lets you run two Modern UI apps side by side (one takes about 75% of the screen, the other 25%). Blue improves this by letting you drag the divider around arbitrarily, so you can have apps split the screen 50/50, 60/40 or basically anything you like.

There's also new touch-friendly Modern UI apps, including a multimode calculator and unit converter, an alarm app, sound recorder and editor, along with a replacement for Movie Maker called Movie Moments that lets you quickly add titles to your videos.

Another positive addition is a better organised and more comprehensive Modern UI 'Settings' menu. Many parts have been reworked, adding categories to make individual settings easier to find, and there are often more of them. There's also access to more advanced settings that you previously had to dig into the 'Control Panel' to access, such as changing when the screen or device sleeps, creating a VPN connection or enabling a network proxy.

Overall, the changes do look to make the Modern UI both more user-friendly and flexible. If anything, they make the current Modern UI look a little bit half-baked.

Blue is expected to be released later this year, though it's unclear exactly how Microsoft intends to roll it out at this point. Early rumours suggest that it may be released as a free Service Pack-style update, and given that most of the changes seen in the alpha are tweaks to Windows 8 rather than a complete reworking of the OS, that does seem likely. With development still ongoing, however, Microsoft has plenty of time to add features, though only time will tell if we'll have to pay to get hold of them.

9/10

$1,299

EDITOR'S apc CHOICE

- FULL HD 1080P 11.6IN SCREEN
- CRADLE WITH THREE DIFFERENT ORIENTATIONS
- HDMI OUT

Acer ICONIA W700

A potent performer.

www.acer.com.au

✓ Extreme performance, HD screen, keyboard folio and cradle included.

✗ Hot, heavy.

Most tablets take after Olympic marathon runners when it comes to their dimensions, with almost zero body fat. The ICONIA isn't one of those anorexic creations. Acer has instead adopted the brutish dimensions of a weight lifter, with a much greater heft and depth than other tablets. It's nowhere near the lightest tablet on the market, but the extra space has been put to good use.

Key to this tablet's size is the large 11.6in IPS 10-point multitouch screen. It's an impossibly crisp 1,920 x 1,080 display, and squeezing a true high-definition display into a package so small is a noteworthy achievement. The Windows 8 'Start' screen is perfectly pixel-free at such a high resolution and apps look crystal clear, provided the source material they're displaying is good enough.

Unfortunately, the ICONIA W700 isn't quite so dapper at contrast performance, with our black level testing showing poor performance when displaying various grades of black. Still, for a tablet it's a bit of a HD marvel, but having so many pixels is a bit of a double-edged sword. Diving into desktop mode, the high resolution makes it very hard to accurately tap icons and menu options, so you'll be forced to run it at non-native resolution, which in turn makes the front 'Start' area look less impressive.

The tablet is housed in a solid aluminium chassis that's 12mm thick the whole way through, and gracing the rear is a 2,592 x 1,944-resolution webcam. It's good enough for random happy snaps, yet seems outclassed by most smartphone cameras. Another camera on the front captures 720p footage. Six small holes on the bottom edge hide the small speakers and it's not surprising that they're a little better than most tablets, given the extra size of the tablet, although they're still not quite loud enough for presentations.

Driving the large display is a full-blown laptop processor in the form of the Intel Core i5-3317U, which comes packing Intel's decent integrated HD Graphics 4000. 4GB of 1,066MHz memory and a 128GB SSD round out the specs, both of which are sizeable by tablet standards. As our benchmarks attest, it's a potent cocktail of hardware, blitzing through our performance tests to take out the top spot. If you want a tablet that can handle the heavy duties of a laptop, this is as good as it gets. This performance comes at a cost, though: when the W700 is getting busy, there's noticeable fan noise and extremely warm spots on the front and rear. Battery life is also less than impressive, burning through our PowerMark test in just 4 hours and 39 minutes, making it the second worst of the lot.

Thankfully, you won't always notice the hot spots, as the W700 comes with a bevy of extra goodies in the slick box. First is the leather folio, which includes a Bluetooth keyboard, converting this tablet into a competent ultrabook rival, while making the overall weight even heavier. There's also a special cradle for extended desk visits, which splits the single USB 3.0 output into three and allows for three different screen orientations: typing, horizontal reading and vertical reading. However, there's no sign of a stylus – an extra that could have proved incredibly popular.

The ICONIA W700 is a brute of a tablet. With an array of extras – not to mention the fastest hardware we've seen in a tablet – the high price tag is easier to justify. If you want a tablet that does it all and don't mind paying with a lower battery life and hotter operating temperatures, this speedy jack-of-all-trades is the one for you.

ASUS VivoTab Smart

Welcome to the future.

www.asus.com.au

Very light, excellent battery life, small.

Relatively weak hardware, only a single micro-USB port, average screen quality.

Ten years ago, nobody could have predicted that in 2013 we'd be buying PCs the size of a magazine, running a full version of Windows, for $600. Yet here we are reviewing the VivoTab Smart and it fits that description perfectly. Ain't technology grand?

The VivoTab Smart is precisely the form factor most people think of when they imagine a tablet. The 10.1in screen is surrounded by a small border of plastic, making it just small enough to squeeze into a handbag or tiny backpack. At 1,366 x 768 the screen isn't quite crystal clear, but the pixel structure is only noticeable if you're activating the touchscreen with your nose. Default contrast performance was impeccable according to our **lagom.nl** image tests, but the same can't be said of black levels, with truly terrible results. If you're watching a dark movie, don't expect to see a lot of detail in the shadows.

The entire tablet is just 9.7mm deep, which doesn't sound much less than the 12mm of the Acer ICONIA W700 behemoth. However, the tapered edges provide the illusion of a much thinner tablet, and it's also a lot lighter at 580g. This won't weigh you down if you're upwardly mobile, but the anorexic weight means some of the hardware inside has been cut down. The plastic case isn't as rugged as some metal tablets, but should go the distance if taken care of. An 8MP camera adorns the rear for happy snaps, while the front houses a 2MP variant for video conferencing and both are relatively average quality. You won't be shooting any Academy Award winners on this tablet.

If you want a tablet that can host lots of external goodies, look elsewhere. The VivoTab only includes a single micro-USB port and the lack of a full-sized port is a shame, given that it's deep enough to host one. There's also no HDMI out, so plugging in a secondary display for presentations isn't going to be as simple as jacking in a cable. There's also no keyboard included, but you can buy the matching ASUS TranSleeve keyboard for another $50 on eBay, which isn't too bad.

Given the low weight, we weren't expecting a supercomputer tucked away inside. Intel's power-sipping Atom Z2760 CPU delivers two cores of Hyper-Threaded performance, maxing out at 1.8GHz when the going gets tough. It's a 32-bit processor, limiting the install to a 32-bit version of Windows 8, but the lack of memory capacity means this isn't an issue, with the tablet holding just 2GB of memory. The CPU's integrated GPU is rather lacking to say the least, which is why this tablet failed our 3DMark Vantage test, as did all others using the Atom Z2760. Storage is limited to just 64GB, so you'll have to be very picky about what you want to install and rely on cloud storage for bigger files. Our PCMark 7 result showed that this isn't a very fast tablet, scoring in the lower realm of results. Having said that, the tablet remains relatively responsive for day-to-day computing duties such as checking emails or browsing the web. It was only when firing up programs such as Outlook that we noticed a slightly longer load time. It'll be fine for light computing duties, but don't expect it to double as a video editing deck when your Apple Mac is in for servicing. Thankfully, the flip side of the low performance coin is excellent battery life, but we couldn't measure it with PowerMark, as it kept crashing after about eight hours. That's still an excellent result.

It's not the fastest or the best-equipped, but we still admire the fact that ASUS has managed to squeeze what is basically a full-blown Windows 8 PC into such a light, tidy form factor. It's also one of the more affordable tablets capable of running Microsoft's new exercise in touch control, making it a very respectable entry-level product.

INCLUDES KEYBOARD

1.4KG WITH KEYBOARD ATTACHED

HP TRUEVISION HD WEBCAM

6/10

$999

HP ENVY x2

All style, no substance.

@ www.hp.com.au

✓ Designer good-looks, very slim in tablet mode, big screen.

✗ Low performance for the price, low-res screen, no USB ports on tablet.

HP has appropriately named its latest tablet, as the ENVY x2 will have friends and family twice as jealous of this shiny new tablet as any other. This is one sexy tablet, with the beautiful aluminium case borrowing from Apple's school of design to deliver a solid yet attractive package. The depth is incredibly skinny at just 8mm, but HP has made it look even skinnier by tapering three of the edges. It's dominated by a huge 11.6in screen and the gloss finish makes the device sparkle and shine like the designer-priced gadget that it is. HP has delivered an ultra-sexy Windows 8 tablet, but the question is whether its features and performance can match up to its good looks.

Firing up the display reveals the first of several disappointments: resolution. At just 1,366 x 768, it's not quite up to the 1080p standards we'd expect of such a large and expensive tablet. Having said that, during the **Iagom.nl** image quality tests, the ENVY x2 exceeded most of the other tablets. Still, when you're paying high dollars it's normal to expect a high-definition screen. Touch controls were accurate and responsive, as were all the tablets we tested.

Moving onto the chassis, there are several inputs and outputs. A large power input on the bottom sits next to twin holes, where the included keyboard snaps into place, converting the tablet into an ultrabook. The keyboard is also built from brushed aluminium and it's very thick, eschewing the paper-thin design of the tablet, not to mention rival tablet keyboards. That's because there's a second battery tucked away inside the keyboard, which can double the battery life. The island design uses large keys to deliver a very comfortable typing experience, which is a huge difference to many of the unusable tablet keyboards on the market.

The usual headphone jack is included and it's backed up by Beats Audio speakers – the same manufacturer behind the Beats by Dr Dre overpriced pieces of junk that all the kids think are cool. As expected, the sound quality rivals that of the AM radio your mum used to listen to, but we can't single out the HP ENVY x2 for this – every tablet suffers the same problem, thanks to their tiny dimensions. There's simply no room in a sub-1cm case for good speakers.

Strangely, there's not a single USB port on the tablet – you'll need to plug it into the keyboard base to unlock twin USB ports and an HDMI output. This is rather bad news if you just want to take the tablet portion of the device out and about.

At this price we expected some seriously good hardware inside, so were shocked to see the same Intel Atom Z2760 processor powering the much cheaper tablets. A petite 64GB SSD is the sum total of the storage on offer, although it can be upgraded to 128GB if you don't mind spending even more. A mere 2GB of memory is paired up with the CPU, again disappointing for the price. It's no surprise that the ENVY x2 didn't blow away our benchmark results, posting in the bottom leagues of all our tests.

It might look the goods, but sadly the ENVY x2 is all talk and no walk. That won't stop those who value good looks over all else from shelling out for such a pretty product, but for those who demand value for money there are much, much better options.

7
10

$936

- OPTIONAL 3G
- OPTIONAL STYLUS
- OPTIONAL KEYBOARD/STAND

Lenovo ThinkPad Tablet 2

Built for business.

@ www.lenovo.com/au

✔ Brilliant stylus, Windows 8 Pro, lots of outputs.

✖ Very expensive, plastic case, underperforming.

Not every tablet owner is a youngster wanting the latest tech because it's the cool new gadget to own. Tablets actually have a valid place in the business world as well, where their ultraportability makes ultrabooks look like backbreaking anchors. The ThinkPad 2 is one such tablet, built from the ground up for those who need to get work done on the road.

The killer feature of this tablet is such a simple inclusion that it's mindboggling few others have thought of it: an optional stylus, which appears to be from Wacom. Note that this must be ordered at the time of purchase, as the non-stylus version won't work with it. Sliding out of its recess in the top-right of the chassis, it's accurate right down to the pixel and will work wonders with the many apps being designed to turn Windows 8 tablets into mobile note-taking or invoicing devices. The stylus includes a small button that serves as a right-click function and we found the Windows 8 Pro desktop much simpler to use with the stylus than with stubby fingers. Even better was Windows 8's handwriting recognition, which worked wonderfully with the stylus – a godsend for those who can't touch type. This feature alone will make the ThinkPad 2 the obvious option for many professionals. 3G connectivity is another must-have for certain users, but it's not included in the purchase price, which seems a little unfair considering the high cost.

Weighing a meagre 650g, this tablet is as portable as they get. It's encased in a solid black plastic case, with a soft rubbery coating that feels pleasant to the touch. The 10.1in screen weighs in at 1,366 x 768, yet pixilation isn't an issue. Unfortunately, black level performance is, with darker blacks all merging into one, a common issue in these ultraportable screens. Thankfully contrast performance is excellent.

For such a tiny chassis, it's great to see the inclusion of micro-HDMI out, perfect for throwing your PowerPoint presentations onto projectors or LCD screens. There's also a full-sized USB port alongside a micro-USB port – a must-have feature for those using the tablet for presentations.

So far so good, but at almost a grand we expected some killer hardware running the show. It's here that the ThinkPad 2 falls down a little, running similar specs to devices almost half its price. Intel's dual-core Atom Z2760 is a far cry from the i5 seen in similarly priced tablets and a meagre 2GB of memory doesn't help. The 64GB SSD comes preloaded with stacks of optional software, leaving just 49GB of usable space. Overall, the end result is a rather lacklustre list of components for a tablet that costs almost $1,000.

On the flipside, Lenovo claims the support for several enterprise features not found elsewhere. Intel's Trusted Platform Module and Computrace Mobile, both of which aid immensely in securing the content on the tablet, are included. The tablet is powered by Windows 8 Pro, which includes several enterprise features such as Encrypting File System, Hyper-V and other features relevant to business users.

There's no doubt that this is the best tablet for business owners, but that doesn't quite justify the high price tag. The additional business-centric features would barely have added to the cost, so it should really be selling at around the $700 mark. Thankfully, most businesses don't mind paying extra for capital expenses – a fact Lenovo probably had front of mind when setting the price.

8/10

$1,399

HIGHLY apc RECOMMENDED

304 X 189 X 11.89MM

FRONT 2MP, REAR 5MP CAMERAS

OPTIONAL 4G/LTE, 3G

Samsung ATIV Smart PC Pro

A heavy tablet that's missing a lot.

@ www.samsung.com/au

✓ Excellent performance, stylus, HD screen.

✗ Small disk, plastic case, low battery life.

By the time we got around to reviewing this tablet, we'd figured out a great, simple way to predict a tablet's performance: feel how much it weighs. If it's as light a small book, chances are it's going to be running a low-speed processor with barely any memory or hard drive space. However, if it's like this Samsung ATIV Smart PC Pro, feeling surprisingly heavy for the slim dimensions, you can rest assured there's some powerful silicon stashed inside.

Weighing 888g, the ATIV Smart PC Pro tips the scales at the heavy end of the tablet market and peering inside reveals why. At the heart of this powerful tablet is the Intel Core i5-3317U CPU, a dual-core, Hyper-Threaded critter that runs at the clipping pace of 2.6GHz under load. The inclusion of Intel HD Graphics 4000 makes it one of the few tablets to support DirectX 10 or above, but don't expect to be playing the latest *Tomb Raider* with all the eye candy. Or any eye candy, for that matter. This might be a zippy tablet, but none of them have the oomph for gaming any more serious than *Plants vs. Zombies*. A solid 4GB of memory provides snappy multitasking capabilities but the one Achilles' heel is the hard drive – a rather underwhelming 64GB SSD – and at this price we expected more.

All of these goodies are tucked away behind the sizeable 11.6in display. Unlike budget displays of this size, this is a true HD beauty, stretching to 1,920 x 1,080. Like other screens of this size and clarity, it's wonderful for presenting Windows 8's 'Start' screen with its richly coloured tiles, but makes navigating the desktop and its miniature buttons and icons quite the chore... unless you use the included digital stylus. Yep, Samsung is another company to realise how nice it is to interact with tablets as if they're digital notebooks. Writing is extremely accurate and the button on the pen serves as a right-click button. Handwriting recognition is utterly amazing – it captured my nonsensical scrawl with ease. When not in use the stylus can be stashed in a small recess at the rear of the case.

For a tablet of this price, Samsung has surprisingly gone for a plastic case, which makes the device look and feel much cheaper than it really is. Cynics would suggest this choice of material helped keep manufacturing costs down, but it might also have been a weight consideration. The 12mm depth of the chassis has made it more than thick enough to host a full-sized USB port, as well as a micro-HDMI output and microSD slot. Two large slots on the bottom are the connection point for the chunky keyboard clip-on, which converts it into an ultrabook while bumping up the weight to 1.6kg. Strangely, there doesn't appear to be a second battery in this heavy keyboard base – Samsung doesn't list it on the specs page and plugging in the base doesn't extend the battery life, according to the Windows battery display.

There's no denying that Samsung has crafted a very powerful tablet in the ATIV Smart PC Pro, yet there are a handful of flaws that stop this expensive product from reaching perfection. A small hard drive, plastic chassis and battery-less keyboard are all strange omissions, although many will simply ignore these issues when they see the impressive stylus in action.

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IS WINDOWS 8 BETTER WITH TOUCH?

Windows 8's new Modern UI is built for touch-based interaction, so do new touch-optimised peripherals help? Dominik Krupinski tests five devices to find out.

There's a lot of hate floating around for Windows 8 from PC users. The arguably inevitable Microsoft push into the tablet world has rendered its latest desktop OS kind of a mess for mouse and keyboard users. I upgraded my work laptop to Windows 8 a couple of months ago and to this day I still find myself cussing it out whenever I want to perform previously one-click actions like displaying the desktop, opening a command line or powering down my machine.

The thing is, *I know* there are keyboard shortcuts for all of these actions. (Show desktop? Windows key-D.) But with only so much space in my brain for remembering key combinations – most of which is already taken up with Photoshop and Premiere commands and *StarCraft* hotkeys – a disproportionately large part of my day is spent trying to replicate Windows' touch gestures by flailing my mouse around a laptop screen and hoping to find an appropriate hot corner.

This frustration has been sufficiently evidenced by my outbreaks of sailor talk that my editor has seen the potential for a story. Cue a pile of Windows 8 touch peripherals on my desk and a brief consisting of: "Do any of these make you shut up?". Only one way to find out.

Logitech T400

The perfect companion to Windows 8.

@ www.logitech.com

✓ Inexpensive, sturdy, easy to program and use.

✗ None to speak of.

Logitech's T400 is probably the closest of these touch peripherals to being a regular wireless mouse and consequently, it's the easiest to adjust to. Aesthetically, it's very similar to the sort of small, portable mouse that's often packed with travel laptops, albeit with a touch-sensitive area in place of the usual scroll wheel. This keeps all the T400's gesture support in one small area, making it easy to slowly build up a knowledge of the mouse's supported gestures while left- and right-clicking as usual. The touch area supports up, down, left and right scrolling, working well with Window's new Modern UI, while clicks to the top and bottom of the area can be programmed to perform a variety of actions. We had ours set to show the desktop, open the 'Start' screen and flick open the Charms bar and this combination gave us all the control we really wanted. The T400 also offers good sensitivity and feels quite solid – certainly more so than some of the 'clickier' gear from Logitech's own stable. A small interchangeable USB dongle takes care of connectivity, meaning those without a Bluetooth-capable PC are still catered for. For day-to-day Windows 8 navigation, the T400 is all the mouse we wanted.

Logitech T620

A lesson in frustration.

@ www.logitech.com

✓ Comprehensive gesture support, good looks.

✗ Imprecise gesture recognition, feels plasticky.

Reminiscent of Apple's Magic Mouse, Logitech's T620 is a palm-sized, pebble-shaped hybrid of mouse and touchpad. With no visible buttons and a surface that supports a wide range of touch gestures, the T620 *should* be a great match to the touch-centric Windows 8 OS. Small gestures like a quick swipe in from the edges mimic touchscreen movements to bring up the Charms bar and the like, while multitouch swipes on the lower part facilitate programmable actions like moving between the desktop, Modern UI and background apps. When it works, that's great, but with no clear delineation between active areas, we often found ourselves frustrated. Many actions rely on movements worded ambiguously by Logitech's software; for instance, 'click lower two-thirds of touch area with two fingers'. No matter where we clicked and with how many fingers, the mouse registered a simple scroll command. It's entirely possible that we're just too stupid to 'get' this mouse, but given that we're already unimpressed with navigation in some areas of Windows 8, being condescended to by a peripheral doesn't help lower our blood pressure. At $70, we'll readily pass on this confusing Apple wannabe.

Logitech T650

A decent peripheral for Windows 8.

@ www.logitech.com

✓ Pleasing surface, programmable gesture support, easy to use.

✗ Expensive, useless for gaming.

Given that this author's day-to-day computer is a laptop with a built-in touchpad, Logitech's T650 shouldn't have felt like a big deal. But it did. There's something vaguely futuristic about using this large wireless touchpad in a desktop setting, which is at odds with the reality that this is a budget alternative to a proper touchscreen setup. Roughly the size of a DVD, the T650 is big enough to easily make screen-crossing swipe gestures and register multitouch commands without feeling cramped or dinky. Regular click navigation is easily replicated here, with hot corners standing in for right-clicks and so forth, while two-finger scrolling should be familiar to anyone who's used a modern laptop. The real boon, however, is how well the extended array of gesture commands work. Three- and four-finger gestures to bring up various interfaces (like the 'Start' screen, desktop or background apps) work quite well with Windows 8, while the replication of touchscreen commands like swiping inwards from the pad's edges to bring up the Charms bar and background app browser is quite natural. We wouldn't quite say the Windows 8 interface makes *perfect* sense on the desktop with this touchpad, but it's probably as close to the tablet experience as a single peripheral will get you.

Microsoft Sculpt Touch Mouse

Ideal for Windows 7, not 8.

@ www.microsoft.com.au

✓ Typically high Microsoft build quality, low price.

✗ Too few programmable buttons.

Visually similar to Logitech's T400 touch mouse, this Microsoft pointer fills much the same low-budget niche with a similarly basic wireless mouse. However, in the Sculpt Mouse's case, that wireless tech is Bluetooth, so you'll need a Bluetooth-capable PC or laptop to use it. That said, despite incorporating a four-way scrolling touchpad into the scroll wheel position, the Sculpt Mouse is missing a couple of the T400's features; namely, multiple programmable middle-click buttons. That means that while this is a pleasant mouse for workday point-and-click navigation, it doesn't offer easier access to any of Windows 8's harder-to-reach menus. That kind of undercuts the whole point of buying this mouse if you've got a Windows 8 system, but we'll grant that the Sculpt Mouse is a nice enough device to warrant a look if you're after a low-cost pointer for older operating systems. We'd happily navigate a Windows 7 desktop at home with this sucker.

Microsoft Wedge Touch Mouse

A little too minimal to navigate Windows 8.

@ www.microsoft.com.au

✓ Distinctive design, tracks across many surfaces, four-way touchpad.

✗ No gesture support, only two buttons.

Whatever else there is to say about it, there's no denying the Microsoft Wedge Touch Mouse's aesthetic novelty. This tiny Bluetooth mouse looks a little bit like a door wedge – or perhaps a piece of cheese – and it really is impressively diminutive. Essentially the clicky bit at the front of a typical mouse with everything else removed, this truncated pointer has the added bonus of having a four-way touchpad built into its surface. If you're unfamiliar with Windows 8, that may seem like a great feature for navigating the horizontal 'Start' screen interface, but any standard (vertical) scroll wheel will work just fine, too, so aside from its small form factor, there's really nothing special about this mouse. Notably, there are no additional touch gestures to bring up otherwise fiddly Windows 8 menus. It's not a bad mouse in and of itself, with typically high Microsoft build quality, but we can't say it improved our experience of the new OS, leaving us just as prone to swearing at it as we were before. apc

SOFTWARE DEV PC

A computer for writing software? Darren Yates comes up with two builds to help speed up software development times.

There was a bit of a discussion over on the **apcmag.com** forum this month, initiated by user DeveloperOfApps, about how to make a good software developer's computer. He admitted to not having built a system before, but wanted a build that would be future-proof for five years, could handle occasional games and perform well on RAD (rapid application development) environments.

FUTURE-PROOF?

No offense to DeveloperOfApps, but if there's a phrase we need to ditch quickly, it's 'future-proof'. In an industry where the future is already the past, it's just not possible to have something that will last without change over five years. As a software developer myself, I could never last more than two years on one machine.

Really, you don't want more than that, especially as a developer. With Intel releasing new CPU hardware every 12 months, even a four-year-old PC is three years off the pace; that's an eternity in this game. To try and future-proof even for five years means spending big on CPU speed now to be passable in five years' time – imagine trying to use a 2008-vintage computer now as a front-line system. It doesn't bear thinking about.

Make your goal a three-year lifespan and you can still achieve great performance in a cost-effective way. Aim for the top drawer in performance now and you'll spend 50%, even 100% more just to get that last 10% of currently available speed, which will be mid-range in two years anyway.

So with that as an introduction, here's how we'd build my next software development PC.

CPU

The last thing you want in a development PC is instability, so don't even think about overclocking. That means two choices: Core i5-3570 or Core i7-3770. The i5-3570 will save you $95, but it lacks Hyper-Threading and a chunk of cache memory. Running a software debugger adds an extra overhead to a development environment so you want extra speed. That's why we'd go with the i7-3770 if the budget will stretch, with the i5-3570 as next choice. Either way, the stock cooler will be fine.

What about AMD's FX-8350? Eight cores sounds great, but if your RAD software isn't multicore-enabled, it comes down to single-core performance and even the i5-3570 typically does better in non-overclocked environments. It also gives the FX-8350 a nudge in some multicore environments, too.

ASK US!

Looking to make your perfect PC, but not sure what parts to buy? Every month, our PC expert Darren Yates solves a readers' PC building quandary. Email us at contact@apctest.com for your chance to get building!

MEMORY

When it comes to software development, the rule for memory is: *do not skimp*. We've developed all of our Linux operating systems on a Windows machine, thanks to virtualisation. It's a far more convenient solution than multibooting, although what it does require is memory and lots of it. Even without virtualisation, we wouldn't mess about here – go straight to 16GB of DDR3-1600 RAM and you won't look back.

STORAGE

To maximise your system speed and responsiveness, we'd be looking for at least one SSD, possibly two. We'd also have a Blue-grade hard drive as secondary storage. The idea is the SSD gives you boatloads of speed for day-to-day development and the hard drive gives you longer-term storage. If you're worried about reliability, you should have a good backup system in place, regardless. Our pick would be SanDisk's 240GB Extreme as the value option (about $190 on the street) or a 240GB Corsair Force GS (about $240) as the 'gold-plate' pick.

We'd go with a 1TB Western Digital Caviar Blue hard drive for general storage – it's a good compromise between performance, noise level and power consumption. Go 2TB Black if you want more of everything.

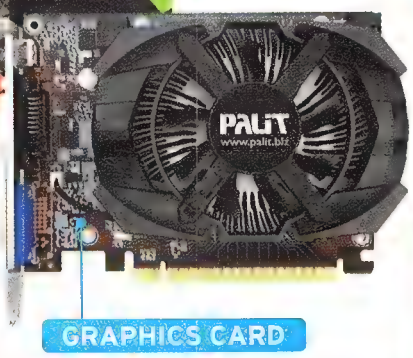
MOTHERBOARD

What you don't need is a hero motherboard with extras you'll never use. The key thing for software development is support for plenty of RAM (that means four DIMM slots minimum), along with at least two SATA 6Gbps ports and six SATA ports of all types. To get the best from an SSD, you need SATA 6Gbps whereas no hard drive pushes SATA 3Gbps to its limits yet, so we'd say two SATA 6Gbps ports would be enough for the next three years. The reality is you're looking for a cost-effective Z77-chipset board and we'd be happy with either the ASUS P8Z77-M or Gigabyte GA-Z77M-D3H-MVP (both are around $110 on the street). Both have four DIMM slots, two SATA 6Gbps and four SATA 3Gbps ports. They're Windows 8-ready and can handle any LGA1155 Intel chip.

PSU

Choose whichever case appeals to you, although you don't want this system carking it because of a dud power supply. We'd be more than happy to spend money on what powers the PC rather than what gets put into it.

More important than the brand of PSU is the manufacturer – look for Seasonic and Delta Electronics-made models for good reliability.



GRAPHICS CARD

Nvidia's GeForce GTX 650, a good choice for occasional gaming and CUDA processing.

PSU

Antec's VP-550P PSU is made by Delta Electronics, so it's good value at $75.

CPU

Overclocking isn't needed here, so save money with cheaper locked CPUs.

SSD

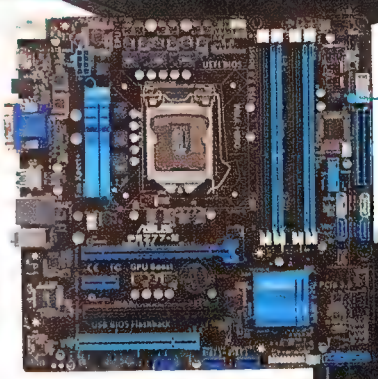
You'd go a long way to find a better-value SSD than the 240GB Extreme.

CASE

Corsair's Carbide 200R case is stylish and roomy and under $80 on the street.

HARD DRIVE

Western Digital's WD2002FAEX – if you want a fast ride, make it Black.



MOTHERBOARD

ASUS's P8Z77-M has room for RAM and six SATA ports, two of them SATA 6Gbps.

Realistically, you won't need much more than 400W; practically, though, PSUs are better value up around the 500-600W mark. For a budget buy, we'd go with Antec's VP550P (about $75 on the street). Otherwise, Antec's HCG-520M, a 520W Seasonic OEM build, would sneak in under $100. Beyond that, we'd go straight to Seasonic's 520W M12II Bronze – it'll cost you around $130, but it'll be just about bulletproof.

MONITOR

While a twin-monitor setup would be nice, you can make a single-monitor build work. We'd look for a 16:10 aspect ratio monitor (1,920 x 1,200-pixel minimum), just to get the extra vertical resolution and more code on the screen. Our budget option here is Dell's 24in U2412M – it goes for $399, but is often on special for under $300. Something like Dell's $800 27in U2713HM has potential, although its 2,560 x 1,440-pixel resolution might be wasted just looking at text; not so if you're rendering.

MONITOR

Give me a 16:10 aspect ratio monitor for coding – Dell's U2412M is our choice.

GRAPHICS CARD

If you go for a single 16:10 (1,920 x 1,200-pixel) monitor and don't need rendering speed, you don't need a graphics card – Intel's HD 4000 graphics engine will do up to 1,920 x 1,200 pixels on its own. If you need GPU performance, a higher resolution or a multi-monitor setup, a GeForce GTX 650 is a good budget option, as it'll handle three monitors if you want and its 384 CUDA cores can give Adobe Premiere rendering a boost. For games, you'd want a GeForce GTX 670 or Radeon HD 7950, but that'll need a decent case and a PSU bump, too.

THE REST

Assuming you want/need an optical drive, we'd choose a Pioneer DVD burner because we've used them for years and they're solid, reliable drives.

As for the operating system, it has to be Windows 8 Pro if you want to future-proof, and with plenty of RAM, you can also have Linux under virtualisation. Just make sure whichever OS you run, it's the 64-bit version, otherwise your RAM will hate you. We're not so fussed about the keyboard and mouse, so use whatever is comfortable to you and your budget. APC

DEVELOPMENT PC

	Build #1	Cost	Build #2	Cost
CPU	Intel Core i5-3570	$215	Intel Core i7-3770	$310
Motherboard	Gigabyte GA-Z77M-D3H-VMP	$110	ASUS P8Z77-M	$110
RAM	16GB DDR3-1600 (4 x 4GB)	$140	16GB DDR3-1600 (4 x 4GB)	$140
Graphics card	None	$0	Nvidia GeForce GTX 650	$130
Storage - SSD	240GB SanDisk Extreme	$190	240GB Corsair Force FS	$240
Storage - HDD	1TB Western Digital WD10EZEX	$69	2TB Western Digital WD2002FAEX	$165
Optical drive	Pioneer DVR220LBK DVD burner	$25	Pioneer DVR220LBK DVD burner	$25
Monitor	Dell U2412M	$399	Dell U2713HM	$799
Operating system	Windows 8 Pro (64-bit)	$149	Windows 8 Pro (64-bit)	$149
Case	Gigabyte GZ-PD-PLUS	$30	Corsair Carbide 200R	$79
PSU	Antec VP550P	$75	Seasonic M12II Bronze 520W	$129
	Total Cost	$1,402	**Total Cost**	$2,276

OUR EXPERTS TAKE AN INDEPTH LOOK AT INTEL'S TINY PC

INTEL'S NEXT UNIT OF COMPUTING

Intel's NUC is a pint-size DIY project straight from the labs of Chipzilla itself, so we dove in to see what tasks it's actually good for.

We can't ignore the rise of the small PC or the living room PC, or whatever you want to call these Lilliputian rigs that are suddenly as popular as raging against Microsoft's divisive Windows 8 OS. This little machine in particular, the Intel NUC, which stands for Next Unit of Computing, seemingly came about as a reaction to the surprisingly popular Raspberry Pi, which is a tiny barebones PC that originated in the UK early last year. While the Raspberry Pi was designed to be an affordable gateway drug into the world of command line hacking, the Intel NUC is a much more complete solution that Intel says is perfect for home entertainment, commercial kiosks or just quiet, affordable computing. Since the NUC (pronounced 'Nuck', though we like to call it the Nuke) doesn't include all the bits that you need to make it run, we figured it was a prime candidate for a Master Builder article.

NUCtural selection

The first stage of NUC acquisition involves deciding which NUC to purchase: there are two different SKUs available as of press time. Both have the same basic specs for storage, RAM and wireless, in that they have none, so you'll have to BYO. They both feature the same 1.8GHz Core i3-3217U Ivy Bridge dual-core Hyper-Threaded CPU soldered to the motherboard, which sadly won't accept a skyscraper heatsink for overclocking; and both also have three USB 2.0 ports. They then diverge, with one featuring dual HDMI ports for multiple-display action, Wi-Fi and Gigabit Ethernet, and the other sporting one HDMI port, Wi-Fi and a Thunderbolt port. The dual-HDMI unit features an all-black chassis, while the Thunderbolt version sports a Corvette-like cherry red roof. There are also two more NUCs coming soon: a high-end NUC with a Core i5 processor and USB 3.0, and a low-end NUC with a Celeron/Atom processor. For this build, we chose the dual-HDMI NUC (model DC32171YE) because we wanted to use it as a quiet, out-of-the-way PC instead of a typical streaming media centre box. Its core components include two SO-DIMM slots, an mSATA slot for an SSD, a wireless PCI Express (PCIe) port, three USB 2.0 ports, Gigabit Ethernet and two HDMI ports. Audio is provided by the HDMI or Thunderbolt ports, but you can't connect your speakers to the NUC. There's also a power brick, but oddly no cable that plugs into the wall, and a VESA mounting bracket included. The NUC includes a three-year warranty and a box that plays the Intel commercial jingle when you open it.

INTEL NUC

	PART	PRICE
Case	Intel NUC	$379
SSD	Intel 525 Series 240GB	$340
CPU	Intel Core i3-3217u	N/A
GPU	Intel HD4000	N/A
RAM	2x 8GB Patriot DDR3-1333 SO-DIMMs	$105
Wireless	Intel Centrino 6235 802.11n mini PCIe	$32
Power	AC power cord	$4
OS	Windows 7 Home Premium (64-bit) OEM	$100
	TOTAL	$960

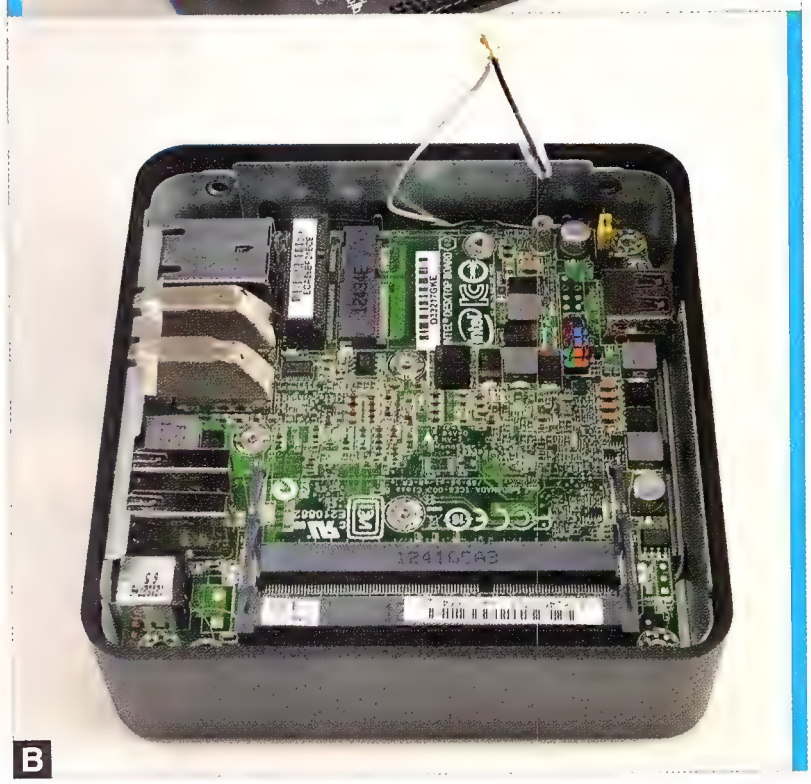
01 Open the case

In order to gain access to the NUC's innards, you'll need to remove the bottom panel from the device, which is thankfully quite easy. Since Intel figures you probably won't be popping open the chassis very often to swap out parts, it's gone ahead and secured it with four easy-to-remove Phillips-head screws (image A). The screws are all captured, too, so you don't have to worry about losing them once you pop off the NUC's ventilated door. With the door removed, you can see the way to remove the motherboard from the chassis is by removing three more small screws. While putting a door on the little bugger isn't a big deal, it's appreciated since Intel could have theoretically made the NUC a closed system in an attempt to reduce support calls.

02 Let's have a look around

With its dome removed, you can finally have a look around the NUC to see where everything goes. As you can tell, this is the belly of the little beast, or the underside of the motherboard (image B), as the Core i3 processor and heatsink/fan assembly are on the other side of the board where active cooling is required to keep things chilly. Down here in passive cooling land, we have a half-length mini PCIe slot for the wireless card, the full-length mini PCIe slot for the mSATA drive, two SO-DIMM RAM slots and one empty header labelled 'Front Panel'. You can't see them, but there are Wi-Fi antennas encircling the enclosure; you can see where they attach to the wireless card. The tiny little motherboard rests inside what looks like a crude metal soap dish, though the 'Intel Desktop Board' logo is proudly displayed. We've heard that despite Intel's plans to get out of the motherboard game after Haswell, it does have a roadmap for the NUC, so plan on seeing several more iterations of this bambino rig in the months to come.

A


B

03 Ram the RAM

The NUC includes two SO-DIMM slots, so you'll need to acquire some laptop RAM, or as our Patriot memory was labelled, 'ultrabook' RAM. We snagged two 8GB SO-DIMMs of Patriot DDR3 PC3-10600 memory, which run at 1,333MHz. We could have gone with 1,600MHz RAM, but we've had some weird experiences previously with overclocked RAM, so for now we're playing it safe. The RAM sticks are a little bit of a splurge for this system's budget, but we threw caution to the wind and maxed out the NUC's memory capacity. Installation is just like it is with a laptop, requiring you to push the DIMMs in at an angle (image C) and then slowly push them down until they snap into place.

04 Wire up the wireless

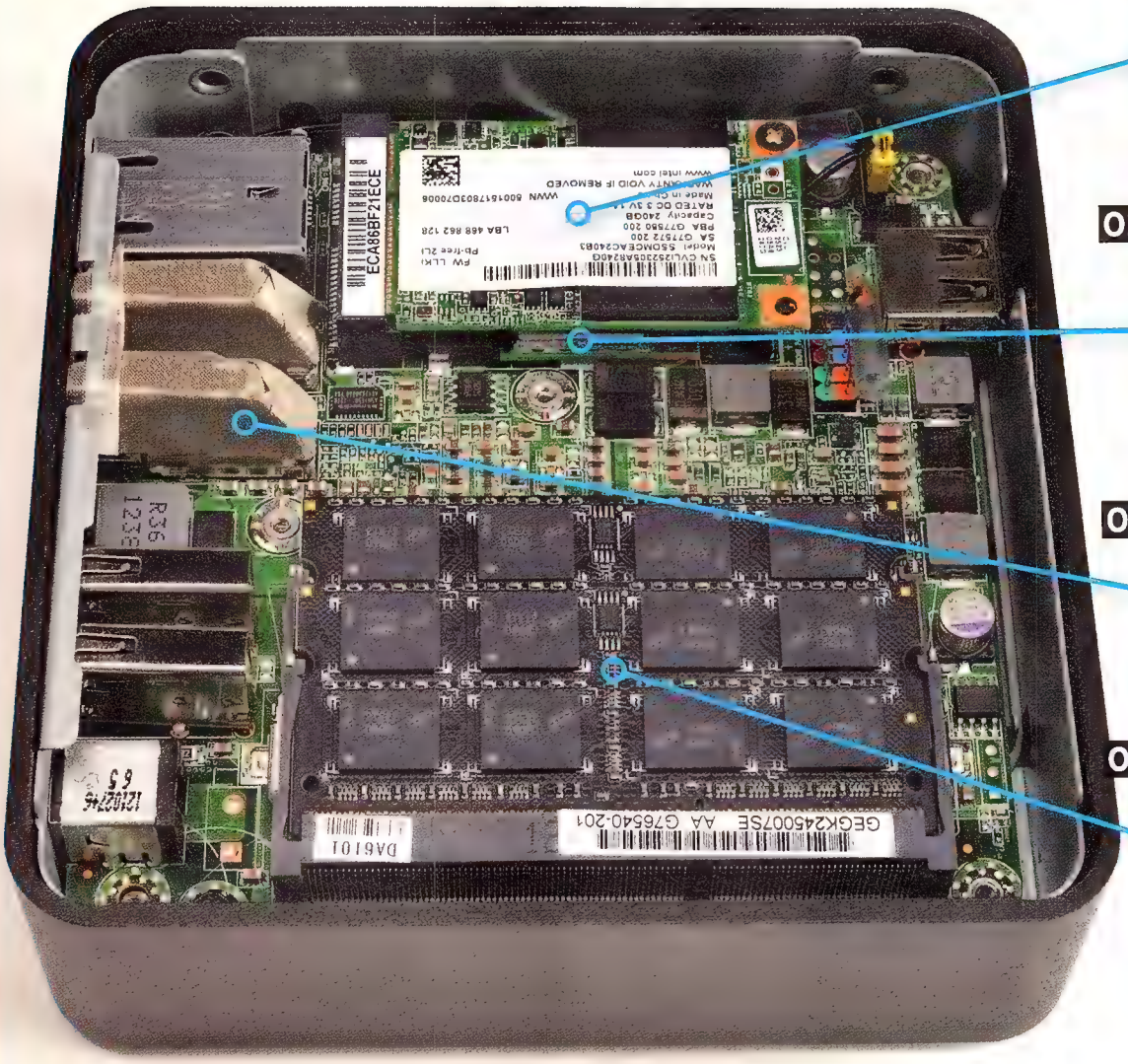
The NUC sports a form factor known as uCFF (ultra-compact form factor). This means it's tiny, so Intel had to stack some components on top of one another like tenants in a high-rise, and two of these tenants are the wireless card and the mSATA card, which sit on top of one another with about a millimetre between them. Due to this arrangement, you must install the wireless card first, which is as easy as sliding the card into the slot (image D) and then attaching the antennas that Intel has prewired to the chassis and dropped down right where the card rests. We connected the black lead to the plug labelled 'Main' and the white lead to 'Aux', but there's no wrong way to do it. We chose a Wireless N card from Intel, although any half-size mini PCIe card will do.

05 SATA-L up

Choosing which mSATA SSD you'll use in the NUC is arguably the most important decision you'll make, as it's the only user-upgradable component that will have a tangible effect on performance. Sadly, modern mSATA SSDs lag behind the blazing-fast 2.5in SSDs we all use today, so shopping for one is a bit disconcerting, as names like Samsung, Corsair and OCZ are nowhere to be found. Instead, the choices boil down to Intel, Crucial, ADATA and Mushkin. Since consumers don't typically purchase mSATA SSDs, the pickings are slim. However, the new SandForce SF-2281-powered 525 Series from Intel is a glimmer of hope, as it rides the SATA 6Gbps interface and is equivalent to the totally fast 520 Series 2.5in drives, so we went with the fat 240GB version. To install the drive, we simply inserted it into the keyed slot and then secured it using the provided screw (image E). And yes, we know this is an expensive SSD, so please don't write us letters saying we spent too much on the drive. This is really just a way to get a good look at what the NUC can do, so a 120GB SSD should offer similar performance.

06 Install the OS

We used a USB optical drive to install our OS. We then went to the Intel web site and loaded the wireless and Intel QS77 chipset drivers onto a USB key in order to get them onto the NUC. Once that was accomplished, we were good to go. All in all, we had the OS installed to our Intel SSD in roughly 10 minutes, and after Windows Update ran a zillion times and rebooted even more, we were finally up and running within an hour (SP2 please, Microsoft). The first thing we did was run the Windows Experience Index test, which showed us a score of 5.9 – pretty dang good for a munchkin rig like this. To put it in context, the AMD Brazos-based ZOTAC ZBOX Nano XS scored just 3.9 in the same measurement.



01 The mSATA drive and wireless card are stacked so tightly that the Thunderbolt NUC will overheat in certain configurations, but we experienced no issues with our dual-HDMI unit.

02 The Wi-Fi antennas that are usually wrapped around a laptop's LCD bezel are strung around the NUC's chassis for improved reception, and attach to a Wi-Fi card that's nestled beneath the SSD.

03 The all-black version of the NUC features two HDMI ports, while the red-rooted model has a Thunderbolt port. Neither model has USB 3.0.

04 On the other side of the mobo (beneath the RAM shown here), lies a Core i3 CPU that's permanently attached and cooled by a heatsink/fan combo that stays extremely hush-hush.

The NUC in the real world, overheating & conclusions

We were pleasantly surprised by the NUC, mostly because we've always had a 'size matters' mantra in our heads that subliminally controls our expectations about a PC's performance. Given the NUC's small size, and our experience with other pocket PCs like the Raspberry Pi and the ZOTAC ZBOX, we expected the NUC to largely suck from a performance point of view, but it didn't. For web browsing, watching movies and running Microsoft Office, it felt just as fast and responsive as any other PC we've used lately. While you're probably inclined to think its speedy nature is partly due to the Intel 525 Series SSD, we also tried it with a garden-variety Intel 310 SSD and that felt quite responsive, too.

Since the NUC includes decent onboard graphics, courtesy of the Core i3 processor, we fired up *Far Cry 3* and *Portal 2* to see whether either was playable. Sure enough, the NUC had some major issues with *Far Cry 3*, but was able to just barely play *Portal 2* at native 1080p resolution with all settings on Medium. For kicks, we ran 3DMark 11 and the NUC scored P581. That means gamers need lowered expectations. Media streaming, however, is great. Among the media files we tried on the NUC was a 10GB HD rip of *Avatar*, which ran on the NUC flawlessly. The same file brought the AMD Brazos-equipped ZOTAC to its knees. The playback stresses the CPU and GPU quite a bit, not to mention the SSD, so we were seriously impressed by its ability to smoothly play such a massive file.

Now for the bad news: we played around with the Thunderbolt version of the NUC and it overheated in testing. Initially, we suspected faulty RAM since RAM can cause random shutdowns, but when we took the top off the NUC we noticed that the SSD and wireless card were burning hot, so we threw a fan on it and all problems vanished. Obviously, that's not a good long-term solution, but Intel is aware of the problem and is working to rectify it. Whether that involves redesigning the motherboard so there's more room between the PCIe connectors or upping the fan speed remains unknown.

All in all, the NUC is nifty, if not slightly defanged for its lack of USB 3.0. We love its small size, decent amount of horsepower and silent operation. We'd totally buy this for our mums if the overheating issue were rectified. We'd also wait for the second generation of the NUC, as the thought of a Core i5 processor and USB 3.0 sounds like a tasty recipe for a quiet, out-of-the-way PC. APC

50 software

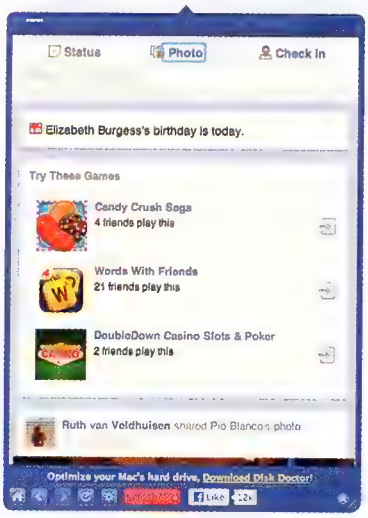
APPS FOR ALL THE PLATFORMS

Mac Store | APPS

MenuTab for Facebook

Free ($1.99 for Pro version) | FIPLAB | tinyurl.com/a8jfc34

Facebook's mobile apps are renowned for their various limitations, yet lauded for the amount of functionality squeezed into a small screen. Indeed, for many users, the web browser view of Facebook is a rarely visited sight indeed. MenuTab essentially provides an iPhone-sized view of Facebook on your Mac, accessible (as the name suggests) from the menu bar. As you might expect, there are a lot of limitations to it – even more than in Facebook's official iPhone app. Some of these are overcome by buying the Pro version for $1.99, while others can be overcome by opening your web browser. Facebook will thank you for doing that anyway, since that's kinda how it makes its money.



aText

$5.49 | Tran Ky Nam | tinyurl.com/bzr93el

A text expansion app saves you having to type frequently used words and phrases in full; just type a predefined shortcut and the app expands it to the full text. It's a real time-saver. It may seem a little niche-y, but the Mac has actually had a number of high-profile players in the text expansion space for some time – decades even. They're useful little apps to have, but they're a little pricey, especially given that iOS 6 has basic text expansion built in for free. Indeed it's a wonder Apple hasn't built it into the Mac OS itself yet. Until it does, there are some less expensive options available now. aText is pretty much on par, feature-wise, with TypeIt4Me ($20). As well as text snippets, you can also use shortcuts to insert images or functions such as the date and time. And if you have multiple Macs, you can sync your defined shortcuts across your devices.

Battle Nations

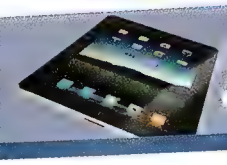
A strategy game with battles.

Free | Z2Live | tinyurl.com/bhqlxp3

Z2Live's *Trade Nations* sim has been making a lot of noise on iOS of late, but if you're not into that style of international politics, *Battle Nations* might be more your speed. Yes, there's all the building stuff and farming and mining that these sorts of games always provide, but in this case it's punctuated with occasional battles, with guns and bombs and boom and whatnot.

The story is wittily written and the characters are entertaining enough to sustain your attention through the tutorial phase of the game, while the graphics and gameplay are enough to keep you going once that's done. The best part is that you can install the game on your Mac, iPhone and iPad – all for free – and keep playing the same game on whichever device happens to be at hand at any point.

Of course, it's a freemium game, but unlike *Real Racing 3*, which we reviewed in our last issue, it's comparatively easy to accumulate sufficient resources within the game to maintain continual play. The main thing you might want to buy with real-world money is nanopods to hurry along things like building shelters or training troops, but that's a question of your own patience.

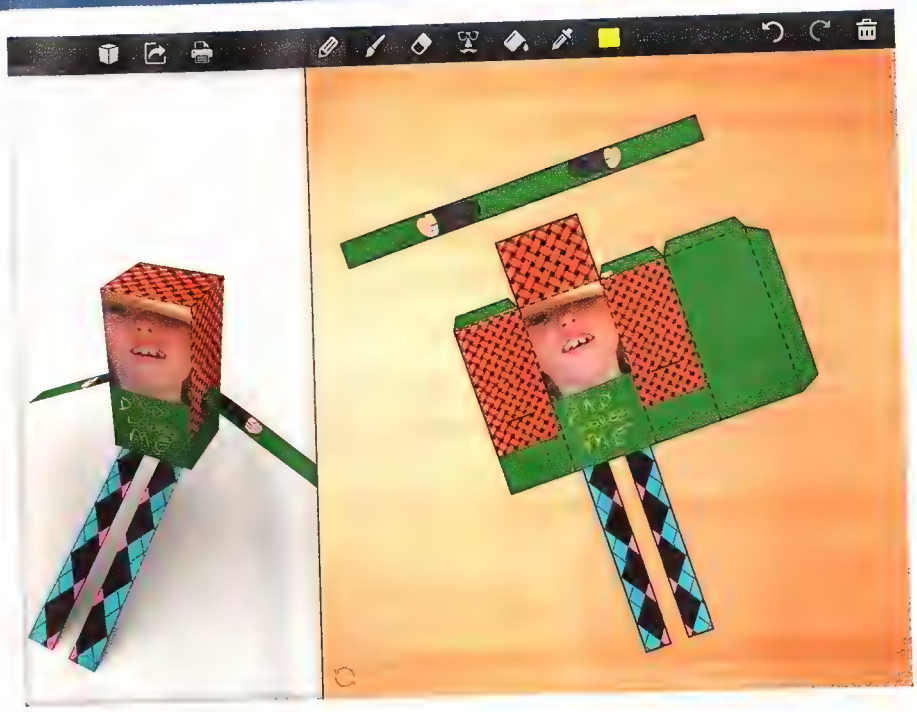


App Store | IOS APPS

Foldify

Custom paper cut-outs.

$2.99 plus $0.99 for additional content packs | Pixle | tinyurl.com/ascdvb2



I was going to write about Foldify last issue, but I couldn't fit it in. I'm glad, though, because an update since then has added in two features I dearly wanted: a Fill tool and the ability to add photos. Now it's pretty much complete.

It's an app that lets you create paper cut-outs and colour them how you want. You then print them out, cut them out, fold along the dotted lines, a bit of glue here and there, and presto – 3D models. It comes with 16 templates for basic geometric shapes, a couple of basic anthropomorphs and a couple of cars, but you can get additional template packs for 99c.

If you have some artistic ability you can let your creativity run wild, but if not there are pre-drawn faces, vehicle parts, house features and so on to make it easier. Plus, you can add your own photos.

iDrumTech

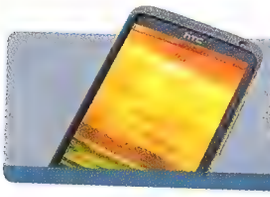
$4.49 | The Web Freaks | tinyurl.com/idrumtech

If you're not a drummer, you won't care about this app. If you're a drummer, learning to be a drummer or you know a drummer and you think it can't be possible that their drums are supposed to sound quite that... dissonant, then this app is a godsend. Tuning drums is more of an art than science really, but if you haven't got a really good ear for pitch, a bit of science can certainly help. Point your iPhone's mic at each lug while you tune your drums and this app enables you to ensure that each one is perfectly in tune. What's more, it will help you make sure that each drum is in tune with the other drums in your kit. You can save presets for multiple kits or multiple contexts; for instance, if you like to tune your kit a little lower for recording and a bit higher for performance. There's also much more to it – a cornucopia of resources at your fingertips. If you have an iPhone and a sense of rhythm, get this app.

BBC Earth Wonders

$4.49 | BBC Worldwide | tinyurl.com/BeebEarth

If you're a fan of the BBC's 'Earth' series – *Planet Earth*, *Frozen Planet* and *Life* – then you'll enjoy this app, which features footage from those series along with additional resources and amazing wildlife photography. The footage is a bonus because the HD clips feature no narration or music. You might think you're getting those clips when you download the hefty 208MB that is this app, but no – you have to download 'packs' of videos separately and at the time of writing, the available packs added up to just under 700MB. So the full package is barely under a gigabyte. Whatever you do, don't download this over 3G – go to the Apple Store and use the free Wi-Fi. In use, though, it's just beautiful. The balance of visuals and snippets of information is just about right, particularly for the younger users at which it's aimed. Well worth a look.



Google Play | ANDROID

SwipePad

Free | Calcium Ion | tinyurl.com/c97p682

This app is so brilliantly executed that I don't know what I did before I installed it. It allows you to swipe from any of nine edges of your screen to quickly access a 'pad' populated with up to 12 shortcuts – apps, contacts, bookmarks, Android shortcuts and, with the WidgetPad add-on ($1.49), any widget – accessible from any app. With the MoreSpace add-on ($1.99), you can even assign different 'pads' to different corners.

Triple Town

$3.99 | Spry Fox | tinyurl.com/6mn93ro

This adorable puzzler is disguised as a town sim. It's also addictive and between sessions of lining up objects three in a row and planning combos, I find myself dreaming of frustrating red-eyed bears ruining my day in the most peculiar ways: parking my car, bear in the way; climbing out of the shower, bear in my way; going to the fridge for a beer, it's been replaced by a tiny bear! For a few bucks you can unlock the full version, making it better value than cigarettes.

Gem Miner 2

$2.19 | Psym Mobile | tinyurl.com/7qzm32o

Dwarves, beards, axes, mines, minerals, sandwiches – if beer was involved, there would be fewer lists more exciting. As a dwarf, you're bound by lore to dig holes into mountainsides, but you're also bound by the laws of thermodynamics; that is, you need energy to dig. So choose your routes wisely and conserve your stamina, for if you run out, you'll lose your treasure. You also only have a finite number of ladders and must avoid countless hazards. Two modes of play give a touch more value to this great title.

Bandsintown Concerts

Receive alerts when your fave artists come to town.

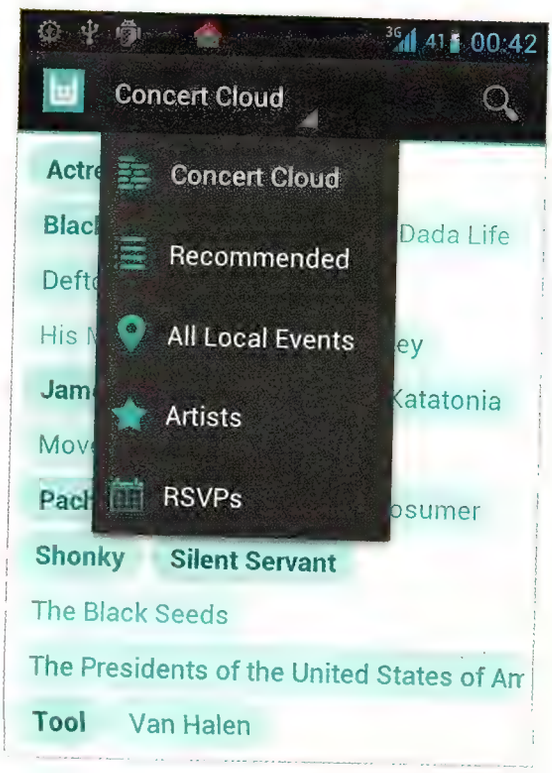
Free | Bandsintown | tinyurl.com/bo9kgwn

When I'm not writing app reviews for you beautiful people, I'm diligently trawling the net for new and exciting music, or the next gig to go to – barely a month goes by where I don't go out and see at least one artist play. Yet, there's still a depressing number of concerts that I miss out on, simply because I didn't know they were happening. There are few things that upset me more than missing a performance from an artist I adore.

So, in this sense, Bandsintown is more than just a notification service for touring artists – it's a sort of side-effect-free anti-depressant.

Usually, these 'tell me your fave bands and I'll tell you when they're touring' apps are a pain to set up, especially when you love a few hundred different artists. Bandsintown makes this process easy, however, as it uses your Last.fm/Pandora accounts and Facebook likes. So just by logging in, my list was already populated with my fave artists and as it turns out, I'd totally missed the fact that one of them was playing just next week, at a bar not 10 minutes from my house.

If you've got nothing to do, it also allows you to browse who's playing around town on any given night. Weekends will never again be boogie-free.



SkyMap

Stargaze away.

$1.99 | Deneb Soft | tinyurl.com/ceh3qcj

SkyMap is an augmented reality app that allows you to see the many constellations, stars, planets and other deep space objects in the sky, simply by holding your phone in front of you. The constellations – including the Milky Way – are rendered in 3D and illustrated in a classical style that harks back to a time when constellations really mattered. Additionally, any class of object – planets, stars and so on – can be removed from the view to clean up the interface.

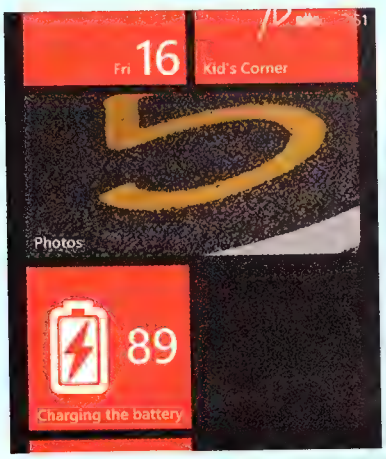
Amateur (or professional, I suppose) astronomers will also appreciate the ability to have the visuals rendered in red, therefore helping preserve your night vision. And if you see something in the sky that you find particularly interesting, it's a snap to quickly pull down some information from Wikipedia about the object.

Plus, if for any reason you need to see what the night sky is like in, say, France, you can actually enter any location or time of day from which to view the sky from. It's almost as good as a real holiday. In fact, I sometimes set up a tent in my lounge room and hang my handset from the tent's ceiling. It's like camping without the icky bugs.

Battery Level for WP8

99c | Alex Golesh | tinyurl.com/crrlwvh

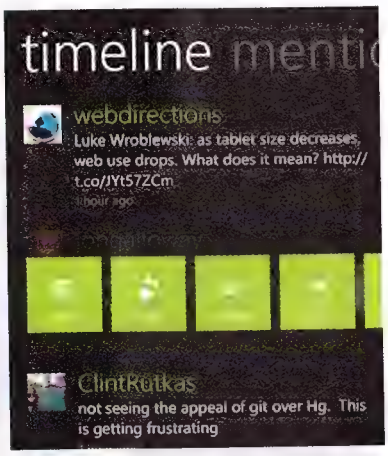
There's a strange part of me that, for no justifiable reason, likes to have a number associated with my battery levels. It's not that I can't appreciate the difference between an icon sitting at three-quarters full and a read-out of 70%, but I just like it that way. Battery Level allows me to display the battery level as a percentage on both the lock screen and the main screen of my handset, as well as access some battery stats – because everybody loves stats.



Rowi

$1.99 | Hidden Pineapple | tinyurl.com/bt7zykh

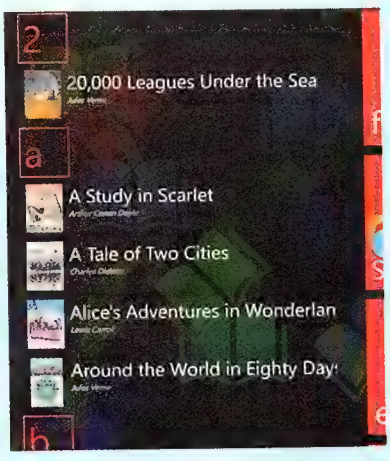
Rowi is an attractive, Modern UI-based Twitter client that provides all the features you really want, like name auto-completion, photo uploads from your choice of services, multiple account support and the ability to send articles to Instapaper, Readability and Pocket. It also throws in a few other features, such as viewing articles via Readability for faster loading, editing photos via Aviary before uploading them and Tweet Marker support, so you can maintain your list of read tweets between apps.

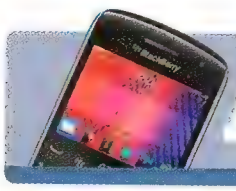

timeline
webdirections
Luke Wroblewski: as tablet size decreases, web use drops. What does it mean? http://t.co/JYt57ZCm
ClintRutkas
not seeing the appeal of git over Hg. This is getting frustrating

Freda

Free | Turnipsoft | tinyurl.com/d79aed5

As far as I'm concerned, an ebook reader is a compulsory addition to every handset that I own. Freda is my choice for Windows Phone because it's free, supports the most popular EPUB, FB2, HTML and TXT formats (unfortunately, it doesn't support Amazon's MOBI format, although since I use Calibre on my PC to manage my ebook library, it's moot) and allows you to download new books from online catalogues like Feedbooks, Smashwords or Project Gutenberg, or from the inbuilt web browser.





App World | BLACKBERRY

Recycle Bin Pro

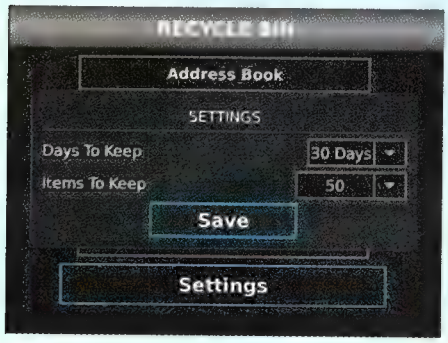
$5 | Amaira Soft | tinyurl.com/cj47bpp

"Fool! You just accidentally deleted a really important email to your really important boss about that really important upcoming meeting. That was a really silly thing to do!"

"Haha! It's no problem. I have Recycle Bin Pro installed, so I can easily restore any accidentally deleted emails, contacts, tasks, memos or events – just like on my desktop!"

"Isn't it a security risk, keeping deleted emails on your device?"

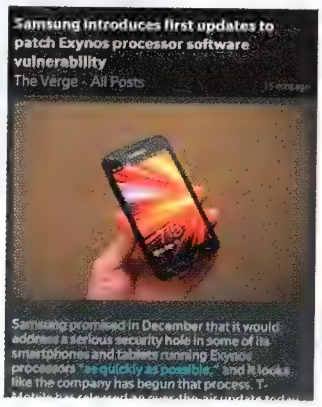
"Now who's the fool? They only stay there for a specified number of days and I can empty it at any time!"



gNewsReader (BB10)

$1 | Yogeshwar | tinyurl.com/cztgyj8

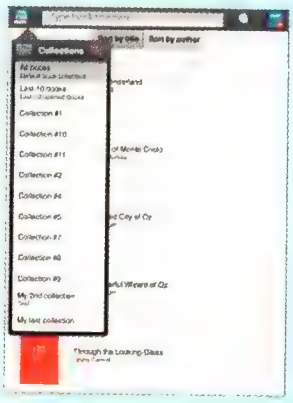
A good RSS reader is a must for any platform and gNewsReader is my current go-to for BB10. The barebones includes features like syncing read and starred items with your Reader account; swiping between articles; 'unread only' mode; image resizing to fit your screen (or removal of images completely); feed subscription management including feed search; sharing of articles to friends and offline reading services like Instapaper.



Book Reader (BB10)

$1 | Untangled Development | tinyurl.com/6mxjmmb

News isn't all I want to read on my phone, so it's important to have a good ebook reader and Book Reader is what I'm using to read my EPUB, MOBI, FB2, TXT and CHM ebooks (this covers just about everything out there, but the developer is adding more formats in the future for those more obscure titles in your ebook library). It includes readymade themes (plus a night theme), but also allows you to customise your own to your liking.



PicShop – Photo Editor

Perfect your photos before you share them out to pals.

$4 | esDot Development Studios | tinyurl.com/cc7r355

Photography is one of the most popular uses for smartphones, but even though phones now have megapixels coming out the wazoo, it's still best to run your photo through an editing program to really get the most out of it. Even if you just take a few short moments to slap your image through an autocorrect, then throw a filter and a nice border over it, you can end up with something close to a masterpiece (sort of close, at least). If you have little more time, you could also hand-draw over the top using your choice of eight brushes, or perhaps add text, speech bubbles or silly little objects like hats and moustaches. Why not really get ahead of the curve and meme-ify a particularly memorable image. Who knows? You may just end up as the next Bad Luck Brian. You can then use the one-click upload function to show it off to all of your besties via your choice of Facebook or Twitter. Because the whole point of taking a photo is to show it off, right? abc

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HACK YOUR ANDROID

Sick of network provider bloatware on your phone? Want your Android phone unlocked? Darren Yates shows you how to gain root access and install new ROMs.

The first question any hardcore Android user asks when they get hold of a new phone is: 'How do you root it?' Before you raise an eyebrow, rooting a phone is the process of gaining root access to the device's operating system and allows you full control. It's not a process without risk, but one many users gladly perform for the world of opportunities it opens up.

Everyone hates the bloatware that clogs up most network-locked phones, apps you neither want or need, but can't delete because they're baked into the OS. With a rooted phone, you can get rid of them fast. A rooted phone also lets you install custom community versions of Android called ROMs, which can bring all kinds of benefits – zero bloatware, smaller size, faster performance and a newer Android version not yet available from your phone provider.

As you're about to discover, gaining root access is part of a preventative fix for one particular phone.

THE RISKS

You can take it to the bank that rooting your phone will void your warranty. Although the odds are small, rooting gone wrong could damage your phone beyond repair (brick it). That said, some of the most popular phones are already at much greater risk of bricking themselves before you start doing anything remotely funky.

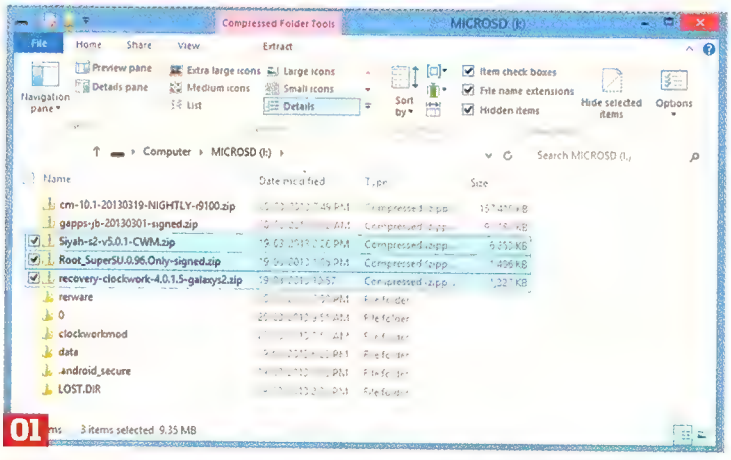
THE GALAXY S II SUPERBRICK BUG

Samsung might well be the world's most popular smartphone maker right now, but its huge-selling Galaxy S II and S III phones are at risk of bricking themselves by simply installing factory updates.

The S II launched with Android 2.3 and received a 4.0.4 update. When combined with a fault found in the eMMC storage chip firmware, the S II can superbrick itself (die an unrecoverable death) if you perform a data wipe/factory reset from the phone's recovery mode and as some claim, even from its Android 'factory reset' function. It's called the Superbrick Bug (**tinyurl.com/873mp6f**). If you have a Galaxy S II, you can check if you have the problem eMMC chip with the free eMMC Brickbug Check app on Google Play (**tinyurl.com/9klkn5b**). If you have the chip and you're using the official Samsung Android 4.0.4 update, tread very carefully.

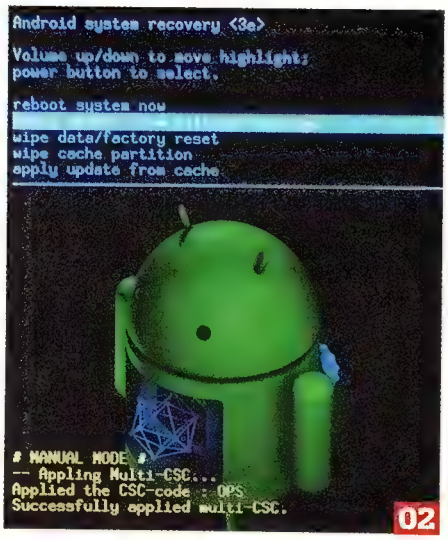
What's extraordinary is the bug exists with the official updates – no rooting or community ROMs are required. It's also a frustrating problem that's not guaranteed to occur on the first occasion you try a factory reset. You may not see it until the third or fifth or subsequent tries. When it happens, the phone becomes superbricked and has to be sent back to Samsung for repair.

ROOTING THE GALAXY S II



01 After making sure your phone is fully charged, download the following tools: 'Siyah Kernel S2-5.0.1' (**www.gokhanmoral.com/?p=1536**) – download the ZIP version; 'Root/SuperSU installer' (**tinyurl.com/d5s6d24**) – see the bottom of the post for 'Root_SuperSU.0.96.0nly-signed.zip' (requires free signup); 'ClockworkMod Recovery 4.0.15' (**tinyurl.com/9cxrl5r**). Copy the Root/SuperSU and ClockworkMod ZIP files to the root folder of an external microSD card and the Siyah Kernel ZIP file to the root of the Galaxy S II's internal storage.

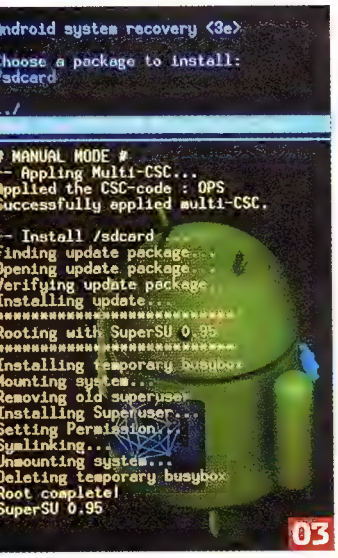
02 Boot your phone into 'Recovery Mode' (press the volume up, 'Home' and power buttons together until you see the Samsung screen) and choose 'Apply update from external storage' (press the power button).



WARNING WARNING WARNING

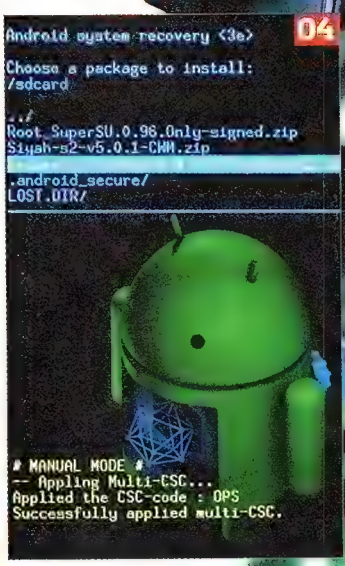
Any flashing of your smartphone will void your warranty. While the guides here were tested on real phones for this story, *APC* provides no warranty on this information. We also can't provide any written or telephone support. Use at your own risk. For more information, search the XDA-Developers web site at *forum.xda-developers.com*.

& INSTALLING THE SIYAH KERNEL

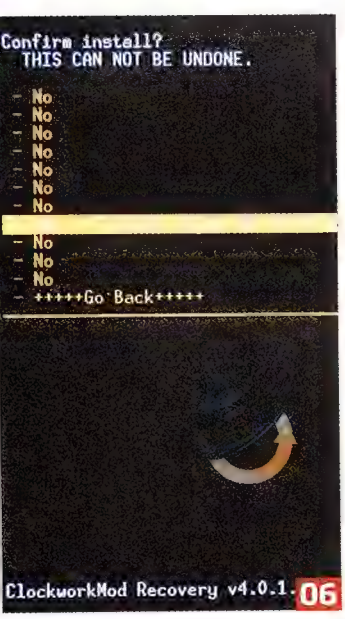


03 Navigate to the 'Root_SuperSU' ZIP file (volume up/down) and select it with the power button. Confirm and let it rip. When you see the 'Root complete!' notification, press the volume up button to get back to the '../' entry; select it and on the original screen, choose 'Reboot system now'. Your phone is now rooted. You can stop at this point, but if you're running the stock Samsung Android 4.0.4 OS, you could still be susceptible to superbricking. The rest of this guide will fix this issue.

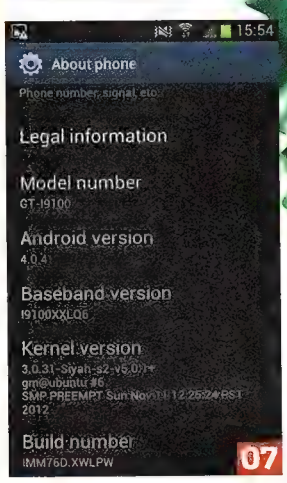
04 Power off your phone again, reboot back into 'Recovery Mode' and choose 'Apply update from external storage'. Locate the 'recovery-clockwork-4.0.1.5' zip file and select it. This will load a temporary version of ClockworkMod Recovery into your phone.



05 When ClockworkMod Recovery appears, select 'Backup and Restore'. Allow it to create a system backup on your S II's internal storage. When it's done, reboot your phone and copy the backup onto your PC (you'll find it in the \clockworkmod folder). Make sure you use Google Sync to make copies of your contacts, email and calendar, use MyBackup Root or Pro to back up personal data and Titanium Backup to back up your apps and copy them to your PC.



06 Power off your phone, reboot into 'Recovery Mode', choose 'Apply update from external storage' and run the 'recovery-clockwork-4.0.1.5' ZIP file again. This time, select 'install zip from sdcard', scroll down the folders until you see the 'siyah-s2-v5.0.1' ZIP file. Select it, confirm the installation and let it install. When it's done, select 'Reboot system now'. This will replace the stock Samsung/Android 4.0.4 kernel with the Siyah 4.0.4 kernel and replace the stock Android Recovery 3e with ClockworkMod Recovery 6.0.1.2.



07 Boot up your phone, head to 'Settings', select 'About phone' and scroll down to 'Kernel version'. If you see '3.0.31-Siyah-s2-v5.0.1+', your Galaxy S II is superbrick-safe.

If you're interested in the gory detail, there's a great back story written by CyanogenMod (CM) developer Andrew Dodd and his dealings with Samsung to find the fix (**tinyurl.com/abu7jeg**). It wasn't a happy experience. In fact, the lack of support from Samsung for the custom ROM community has seen some of the major community developers walk away from further Samsung work. Team Hacksung, the group behind the Samsung versions of the popular CM ROMs, has reportedly said it's had enough of Samsung and won't be supporting the new Galaxy S IV. That forced the CM team to come out and deny rumours that it would also boycott the phone, saying it doesn't yet have a stance one way or the other and won't before the phone is released.

S II ROOTING THE RIGHT WAY

You can still root and flash a new ROM on the Galaxy S II. In fact, until the official Android 4.1.2 update was released in Australia in late March, rooting your S II was an important step in avoiding superbricking.

Technically, the bug lies inside the S II's Android 4.0.4 kernel, caused by a function called 'secure flash erase' (MMC_CAP_ERASE). Unlike the original Android 2.3.6 OS that came with the S II, Samsung's Android 4.0.4 release performs a low-level erase whenever you do a factory reset – that's a bit like automatically flashing the BIOS on a motherboard when you're just reinstalling the OS on the hard drive. In combination with the problem flash chips, it corrupts the \data partition, superbricking the phone. Given you can 'factory reset' your phone through the 'Settings' menu, it's a dangerous fault to have.

There is a solution. First, root your phone and straight way, flash a new 'insecure' kernel that has the MMC_CAP_ERASE command removed. Doing anything else invites the superbrick bug for dinner.

An insecure kernel is one that offers Google's computer ADB (Android Debug Bridge) root access to your phone – it's a necessity if you want to run other ROMs and fix the superbrick bug. There are a few kernels to choose from: the three we suggest looking at are Siyah, Dorimanx or the Codeworkx kernel that comes with recent CM ROMs. Siyah is a good, no-fuss option while Dorimanx is a performance kernel. It's basically for phoneheads for whom too much tweaking is barely enough.

INSTALLING A CUSTOM ROM ON AN S II

Now that you've rooted your phone and presumably, installed a fixed superbrick-free kernel, you're ready to head off into the world of custom community ROMs. Why would you want to? Well, for starters, you could find a newer version of Android for your phone than what's officially available. For example, at we were going to press, Optus was releasing an Android 4.1.2 update for the Galaxy S II while over at CyanogenMod (**cyanogenmod.com**), the latest Android 4.2.2 release was on offer.

Before you rush off, check the fine print – while you expect the stock ROMs to have all features working, it's not always the case with community ROMs. There are two ways to build a ROM: you can base it on an official vendor stock ROM or you can build from Google's Android Open Source Project (AOSP). CyanogenMod 10.1 (CM10.1) comes from the AOSP version of Android 4.2, but it lacks the code for Galaxy S II's MHL connector, so video out doesn't work. To get MHL working, you need a community ROM that's based on a Samsung stock ROM, such as WanamLite (**tinyurl.com/aq3n3pd**).

SECURITY CONCERNS

Another issue is security. We spoke to NAB last year for a story about smartphone security and banking. Its recommendation was: don't bank on a phone that's been rooted. While Android is pretty solid when it comes to security in general, rooting your phone and installing a community ROM opens up risks. If you don't bank with your phone, it's unlikely to be an issue. The other thing is that ROMs from well-recognised sources like CyanogenMod should be quite safe, as anything even remotely dodgy would be quickly rounded up by users.

If you're the nervous type when it comes to security, stick with an official stock ROM for peace of mind, but provided you stick to apps from Google Play and don't do anything stupid, you shouldn't have trouble.

CHOOSE YOUR ROM CAREFULLY

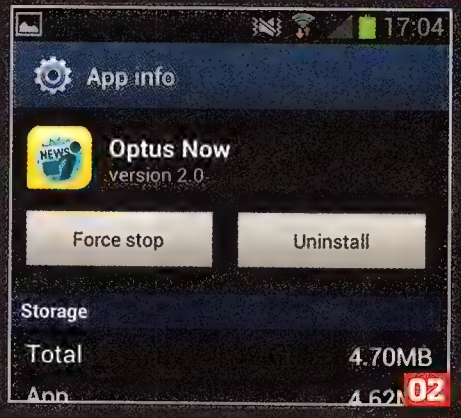
There are ROMs available for every phone, so it's important you select a ROM that's designed for your specific model. We can't stress this enough. For example, 'Galaxy S II' is the generic name for up to five different models: the GT-I9100, GT-I9100G, GT-I777, SGH-T989 Hercules and Skyrocket. If you have a GT-I9100 (it's shown on the Samsung splash screen when you boot up), you can't use a ROM meant for the GT-I9100G because they're not the same phone under the bonnet.

REMOVING NETWORK BLOATWARE

Because network bloatware is baked into the operating system, you must first root your phone. After that, follow these steps.

01 Start your phone, head to 'Settings > Applications', scroll down the list until you find an offending piece of bloatware and select it.

02 Press the 'Force Stop' button and then the 'Uninstall' button. Confirm the uninstall process and tap 'OK'. Note that for some network-bundled apps, you may need to do this twice to get rid of the app and the menu icon. After that, it should be gone for good.



BACK UP BEFORE YOU FLASH

You also need to back up your phone before you flash a new ROM. Flashing ROMs requires your phone's flash storage to be wiped, so you need to back up everything – files, apps, contacts, SMSs, emails, the whole shebang – as they won't be there when you launch your new ROM.

First, install MyBackup Root from Google Play. It's an easy-to-use app for backing up your data. For backing up apps, the best option is Titanium Backup. It's also free from Google Play. Other apps like SMS Backup and Restore are worth a look and don't forget Google's own Sync option.

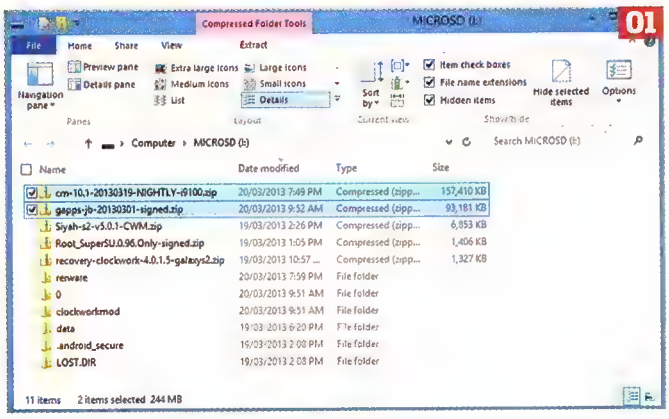
And most importantly, don't leave your backups on the phone storage – copy them to your computer.

INSTALLING A NEW ROM

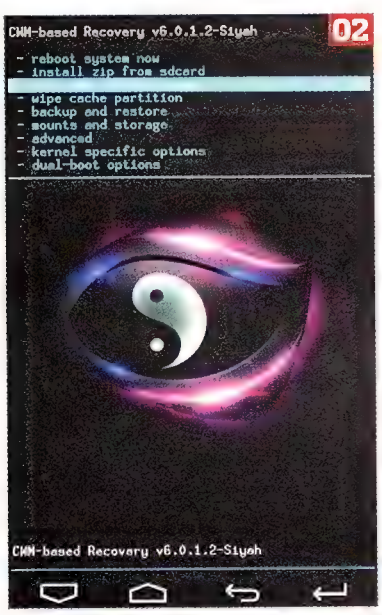
Once you've done everything up to this point, installing a new ROM is reasonably straightforward and uses many of the same steps you performed in rooting your phone.

INSTALL CM10.1 (ANDROID 4.2.2) ON A GALAXY S II

Make sure you've rooted your phone and if you're running the stock Samsung 4.0.4 Android release, that you've flashed in a new brick bug-free kernel. You should also perform a Nandroid (flash) backup of your current setup (the latest CWM Recovery can back up direct to an external SD card) and back up your system using a combination of MyBackup Root and Titanium Backup. See the previous guides for details. **WARNING** – flashing a new ROM may brick your phone. Following this guide worked for us, but you do this at your own risk.

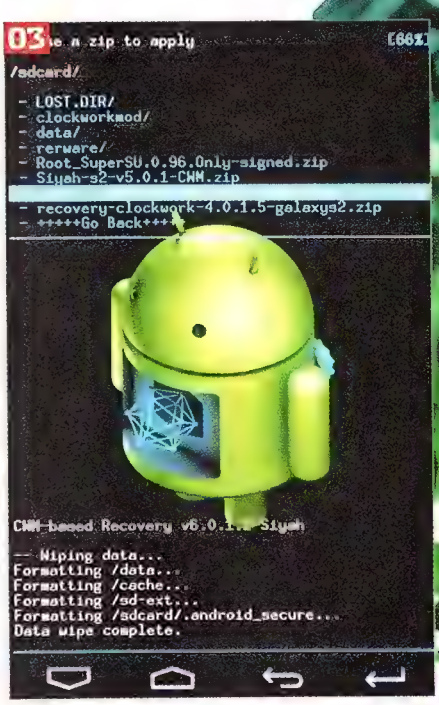


01 Download the latest CM10.1 nightly update ZIP file from the CyanogenMod web site at **tinyurl.com/bmx9vr3**. **WARNING** – make sure you choose the ROM for your specific phone. Copy the ZIP file to the root folder of your S II's SD card using your PC and Windows Explorer, along with gapps (Google Apps) from **goo.im/gapps** to the same root folder. Make sure the version you download matches the version of CyanogenMod you install.



02 Boot your phone into 'Recovery Mode' (press and hold the volume up, 'Home' and power buttons until you see the Samsung splash screen). When you see the ClockworkMod Recovery screen, select 'Wipe data/factory reset'.

03 When completed, navigate back to 'Install zip from sdcard' and select it. Tap 'Choose zip from sdcard' and navigate to the CM10.1 ZIP file you copied earlier. Confirm the installation and let it go.



04 Next, follow step 3 again and install the 'gapps.zip file' now, or reboot now and install it later (do it later and you'll get the new CM10.1 'Recovery Mode').

05 When that's done, navigate back out to reboot your phone. You'll have CM10.1 with the Play Store app installed ready to go. You can also begin syncing/restoring your contacts and settings.

One last important point. If you're upgrading to a new version of Android (going from 4.0 to 4.1 or 4.1 to 4.2), don't try to restore your apps; you should reinstall them. Think of it like trying to copy your apps from a Windows XP box to a Windows 8 one – it won't end well.

GALAXY S III'S SUDDEN DEATH SYNDROME

Meanwhile, the Galaxy S III has a different fault, ominously called the Sudden Death bug, but it's related to the eMMC chip bug issue in the S II. You can use the eMMC Brickbug Check app to see if you have the problem eMMC chip. Basically, if you have the 16GB version of the S III, you're running Android 4.1.1 or older and the VTU00M eMMC chip with 0xF1 firmware revision (FWrev), you're ripe for a hit of Sudden Death.

The fault is in the eMMC chip's firmware, which causes it to just suddenly die. It's also said to affect some early first-generation Note II phones that use the same eMMC chip. The internet is littered with forums covering this, but the Whirlpool thread at **forums.whirlpool.net.au/archive/2030080** is probably most relevant to Australian users. So far, more than 60 Whirlpool users have detailed their Galaxy S III Sudden Death experiences.

The official fix appears in the 4.1.2 updates that have been pushed out by telcos since mid-January this year, so if you haven't done so, make sure you download and install the update as soon as possible if your phone has all the Sudden Death factors. It also means you must stick to 4.1.2 or later Android versions to remain safe. Drop back to 4.1.1 or earlier and your phone is susceptible again.

For the latest information, check the XDA Developers Sudden Death thread at **tinyurl.com/blvq8u8**.

GALAXY S III'S EXYNOS MEMORY BUG

Google has been pretty vocal of late in the face of security software vendors claiming Android is a security risk. However, Samsung Galaxy owners have special reason to be concerned through a bug relating to Samsung's Exynos processor. It was discovered in mid-December 2012 that the Exynos memory module gives full read and write access to physical memory and offers the potential of numerous attack vectors for unscrupulous hackers. The bug covers a range of Samsung devices using the Exynos 4 processor including the Galaxy S II, S III, Note, Note II, the Galaxy Camera and Note 10.1.

To its credit, Samsung plugged up the hole in early January this year, so if you haven't already, make sure your firmware is up to date. Although reports are that XXELLA firmware is required to patch Galaxy S III phones, the latest firmware available from Australian telcos at the time of writing was the older XXELL2. However, we were able to test it with the ExynosAbuse-1.40.apk app from XDA Developers (**tinyurl.com/clambk3**; requires signup) and the problem appears to have been fixed with this firmware release as well.

ROOTING YOUR GALAXY S III

Until it was fixed, the Exynos memory bug provided an easy way to root your Galaxy device. However, it can still be done and the simplest way is using Samsung's ODIN phone flash tool and XDA Developer Chainfire's CF-Auto-Root package.

The most important thing about CF-Auto-Root is you need to grab the right version for your phone – as we mentioned earlier, use the wrong one and it could spell disaster. You can download the files from **autoroot.chainfire.eu**. However, unlike most rooting tools, it aims to leave your phone as close to stock as possible. Note that this may increment the S III flash counter, which counts how many unofficial firmwares have been installed, in case of warranty claims. Triangle Away from Google Play ($2.49) should be able to fix that.

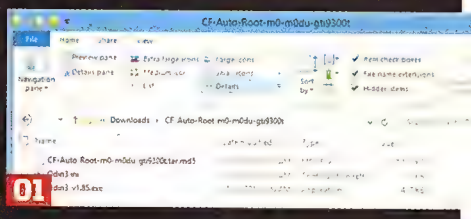
INSTALLING A NEW ROM ON YOUR GALAXY S III

If all you want to do is to root your Galaxy S III, our rooting step-by-step guide is all you need. However, if you want to install a new ROM, there's more you need to do.

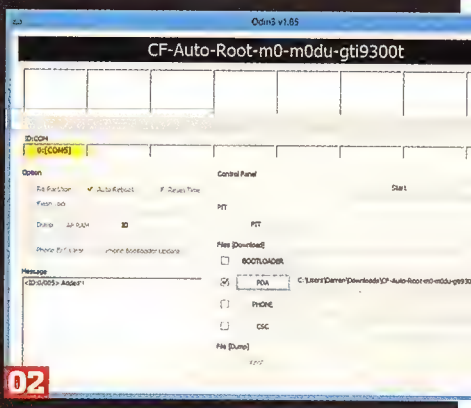
First, back up your contacts, calendar, SMS, call log and so on, just as we described with the Galaxy S II. MyBackup Root is your best bet here, followed by Titanium Backup for your apps. Again, we wouldn't recommend trying to copy your apps across to a new ROM – it'll end in tears. Install them from scratch. APC

ROOT YOUR 3G GALAXY S III

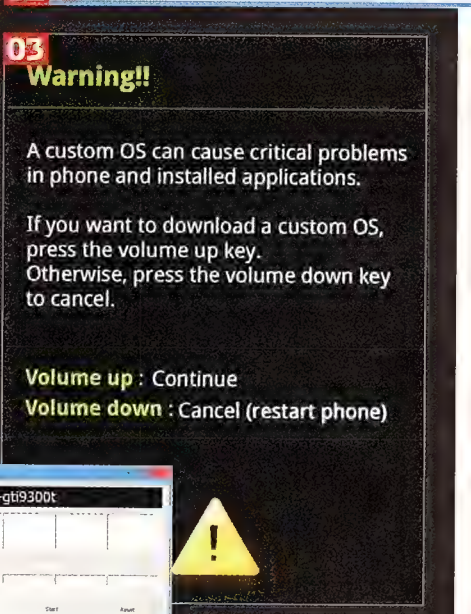
01 Grab the right CF-Auto-Root version for your phone from *autoroot.chainfire.eu*. Make sure your Galaxy S III phone drivers are installed on your Windows PC and that your phone is charged and ready to go. Unzip the file to a folder on your PC and you'll see it contains the ODIN flash tool plus the root archive ('TAR.MD5') file.

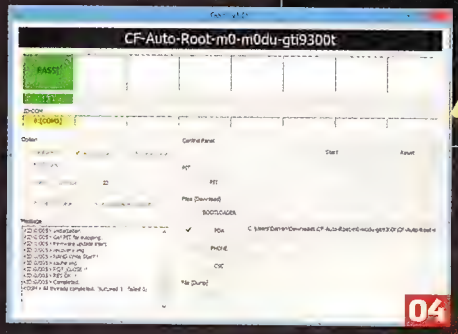


02 Launch ODIN, click the 'PDA' button and load in the 'TAR.MD5' file.

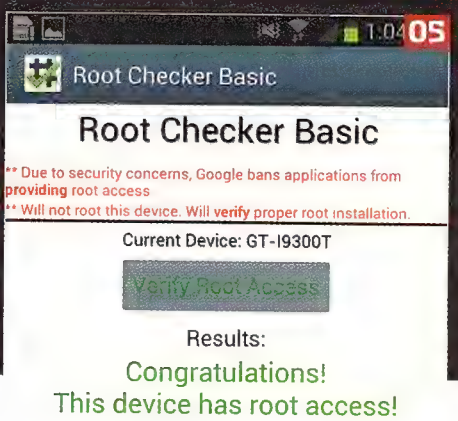


03 Power off your Galaxy S III and boot into 'Download Mode' (hold down the volume down, 'Home' and power buttons; let go when you see the warning screen) and confirm when asked. Plug your phone directly into your computer and make sure that the 'Re-partition' checkbox in ODIN *is not* checked. When you're ready, press ODIN's 'Start' button.


03
Warning!!
A custom OS can cause critical problems in phone and installed applications.
If you want to download a custom OS, press the volume up key.
Otherwise, press the volume down key to cancel.
Volume up : Continue
Volume down : Cancel (restart phone)



04 Within 10 seconds, you should see a big green 'PASS!' notification. At the same time, your phone should automatically reboot.

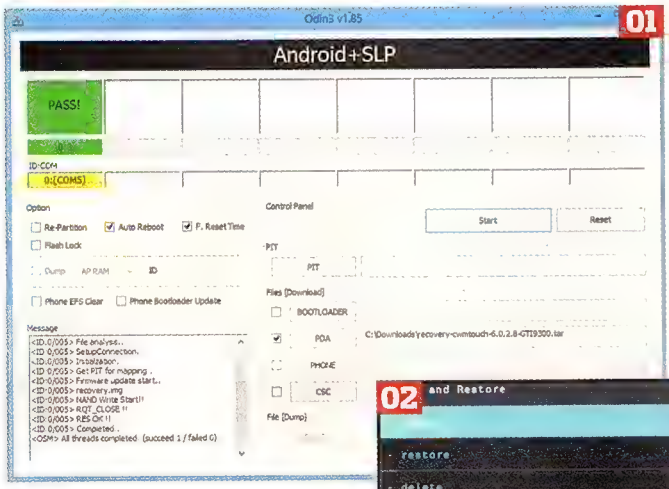

05
Root Checker Basic
Root Checker Basic
** Due to security concerns, Google bans applications from providing root access
** Will not root this device. Will verify proper root installation.
Current Device: GT-I9300T
Verify Root Access
Results:
Congratulations!
This device has root access!

05 Allow your phone to boot and download Root Checker from Google Play. If you see the 'Superuser Request' screen, press 'Allow' and Root Checker should confirm your phone is now rooted.

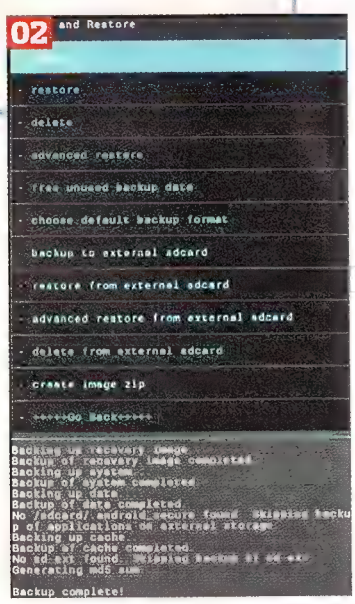
For more technical Root Checker output, please see my application, Root Checker Pro.
For more information about Root, please see my application, All About Root.

FLASH CM10.1 ONTO A GALAXY S III

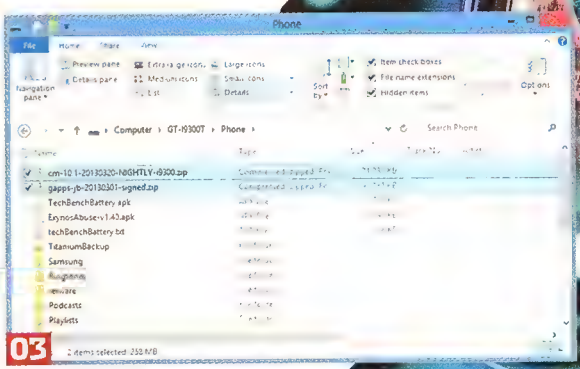
We'll assume you've already rooted your phone using our guide and performed a MyBackup Root/Titanium Backup/Google Sync backup combo with copies of the backups on your PC. Here's what you do next.



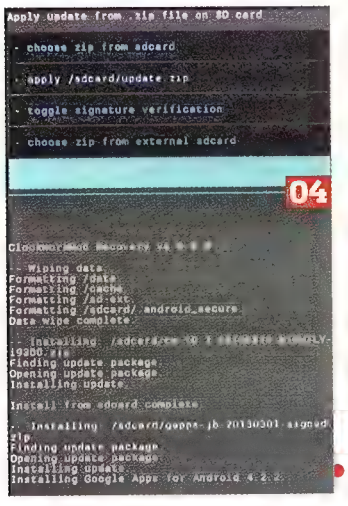
01 Download the CWM Recovery TAR file from **tinyurl.com/c9pcwtu** (requires signup) and install it onto your phone using the 'Root your Galaxy S III' guide opposite, replacing the 'CF-Auto-Root' TAR.MD5 file with this 'CWM Recovery .tar' file instead. Note that this will permanently replace the Android Recovery 3e option with CWM Recovery.



02 Once you have CWM Recovery installed, turn off your phone, reboot it into 'Recovery Mode' (volume up, 'Home' and power buttons). When you see the menu, scroll down to 'Backup and Restore' and create a full Nandroid backup of your phone. Copy the backup onto your PC (you'll find it in the \clockworkmod folder on your phone's internal storage).

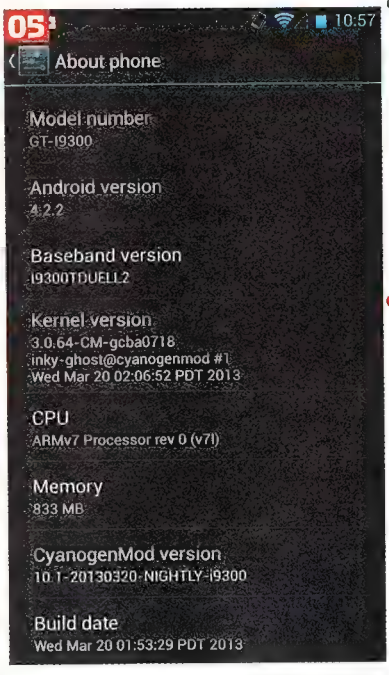


03 Download the latest version of gapps (Google Apps – Play Store) from **goo.im/gapps** and grab CyanogenMod 10.1 for the Galaxy S III from **www.get.cm/?device=i9300** (for GT-I9300 and I9300T only). Copy these to the internal storage of your S III.



04 Now follow steps 1 to 5 of the Galaxy S II/CM install guide on page 59. The process from here on is the same.

05 At the end, you can go to 'Settings > About phone' and see your new Android version information.



ROOTING & FLASHING OTHER PHONES

There's no guaranteed one-size-fits-all way to root and flash any phone yet, but in the meantime, we suggest looking at *tinyurl.com/croxn7a*. This is the method we used to root the Galaxy S II and it's said to work for almost all Android 4.0+ (Ice Cream Sandwich) phones. As for ROMs, it's not perfect, but CM is arguably the safest and most popular of community ROMs available. It supports a huge range of phones with daily updates for many of them – you can see the support list at *tinyurl.com/b86r8f8*.

GETTING ROOT ACCESS

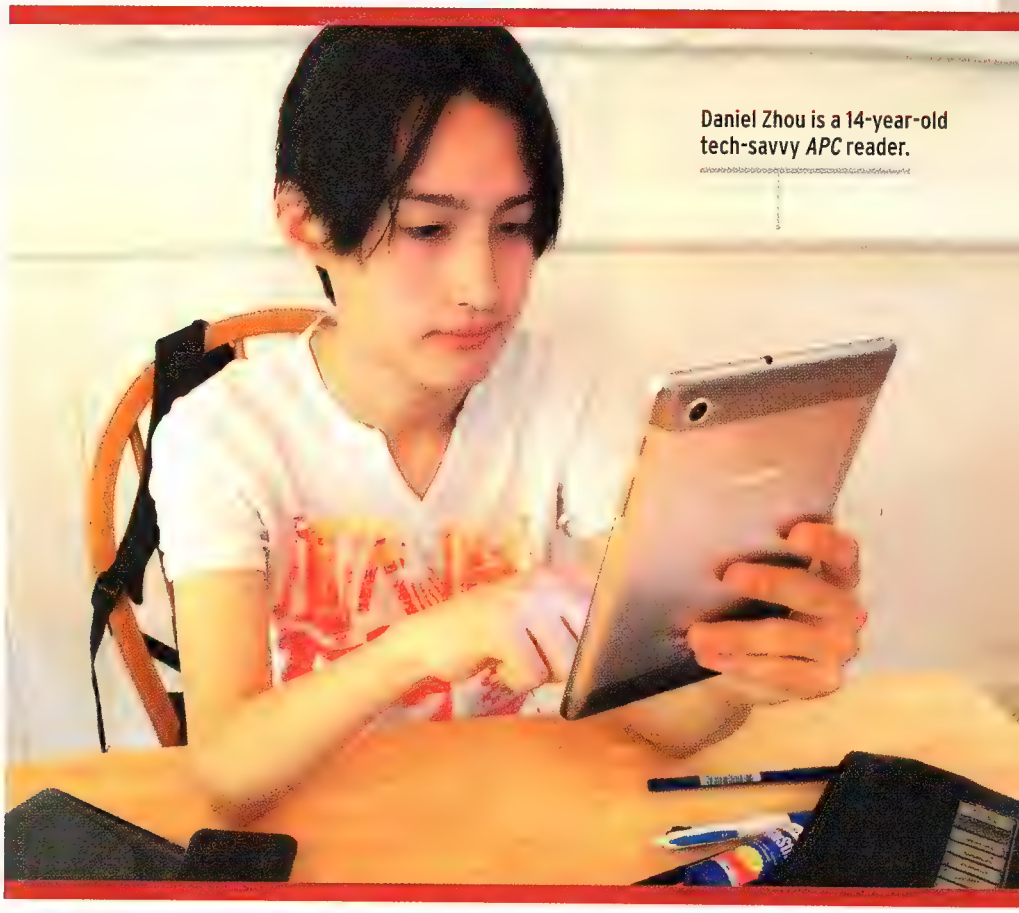
Daniel Zhou is a young *APC* reader/geek who recently rooted his Samsung Galaxy Tab 7.7 and upgraded from Android 3.2 to 4.0.4 Ice Cream Sandwich. He tells us how and why he did it.

I love my Samsung Galaxy Tab 7.7 tablet, but when there was no indication that the Android 3.2 Honeycomb OS was going to be upgraded anytime soon by Samsung, I decided to upgrade it myself. I was aware of the potential risks because I had rooted a couple of Android devices before and was not always successful (I'd had to replace my new high-end smartphone after trying to root it from Gingerbread to Ice Cream Sandwich).

Knowing what could go wrong and keeping in mind that rooting my device would void any warranty if bricked, I took particular care this time round. Firstly, I was careful not to have any mess around the plug because if the device got unplugged during the syncing process it may have caused the boot loader to scramble beyond recognition and become unusable.

These are other things I took into account to reduce risks:

- I made sure that there were no obstructions on my desk. Having a tidy desk also helped my concentration.
- I backed up all my personal files and settings onto my computer (I have a Windows PC – I don't think this will work for a Mac).
- I made sure the correct drivers were installed for the tablet.
- I disabled automatic sync with the computer so it wouldn't interfere with the process.
- I had the proprietary USB cable for file sharing ready.
- I recommend a hard factory reset before starting the procedure as the results will be more predictable.



Daniel Zhou is a 14-year-old tech-savvy *APC* reader.

HOW I GOT ROOT ACCESS

Firstly, I needed to find out exactly what device I have. I searched the web for **root Samsung Galaxy Tab 7.7** . This came up with a bunch of search results mentioning my device. I noted that there were variants of the same model and support for different types of software and hardware. I could tell the difference by the specific model number assigned to my variant GT-P6810. After sifting through the search results, I worked out that most people rooted their Galaxy Tab 7.7 with the 'Odin method', which uses the Odin tool that Samsung uses internally to flash firmware to its devices.

Luckily, I found a web page that gave me a comprehensive list of instructions to follow, including warnings and risks, the requirements and the software to download, including the firmware file 'P6810XXLPK_P6810OXALPK_UEX.zip' which was 566MB (the host software is known as Odin3-v1.85).

After downloading both files and launching Odin as prompted, I followed every step-by-step instruction. I turned off my tablet and rebooted it into a special download mode by pressing and holding down the power and volume down keys. That came up with the warning statement about how a custom OS can cause critical problems. I pressed the 'volume up' key to enter download mode. At this point I knew it was fragile and I cautiously connected my tablet to the computer. Odin recognised it by saying 'Added!'

I clicked on the 'PDA' button in Odin, which located the firmware 'P6810OXALPK_P6810XXLPK_HOME.tar' within the ZIP file to add to Odin. Although this step was suggested after plugging in, I did it before to make sure

> Knowing what could go wrong and keeping in mind that rooting my device would void any warranty if bricked, I took particular care this time round

that the ZIP file was in place. I disabled 'Re-partition' under the 'Options' bar and then pressed the big 'Start' button, which began the process. I could see it in action down the bottom-left of the window as well as on the device's display.

After a nervous few minutes, Odin had finished the rooting by saying 'PASS'. My tablet came to life with its brand-new software. Success! I managed to root it without any major problems. However, the new software wasn't perfect. I found some problems with the ROM/MOD: the date reset itself back 12 years. The time reset itself seven hours too early. I got to school late the next day.

The device would at times refuse to connect to my Wi-Fi network, which was annoying, but often remedied by restarting my Wi-Fi modem. When I first went on to the Google home page, my device came up with a peculiar onscreen message. It claimed that **google.com** was a security threat and it was not to be trusted. What a bold accusation! Otherwise, the Honeycomb form of Android is overall as satisfying as expected. I'm now planning to upgrade my device to Android 4.2.

Success! Daniel now has a freshly rooted Samsung Galaxy Tab 7.7 running Android 4.0.4.

FEATURE

THE WORLD'S COMPUTERS

Jamie Middleton goes behind the scenes of the technological arms race and learns the consequences of falling behind in global supercomputing.

Forget the space race to Mars – the real technological arms race is taking place in super-cooled bunkers across the globe as countries compete to take the crown of fastest supercomputer on Earth.

Supercomputers are big business. They provide the power to dramatically reduce research time, to accurately simulate and model real-life systems, and to help design products perfectly suited for their environment. Nations that invest in supercomputers can quickly reap the benefits in terms of technological advances, not to mention the kudos of being at the very forefront of technologies that are already changing the world we live in. There's a definite pride in being the best in the supercomputing sphere – a pride the US enjoyed since 2004. Therefore, it was big news when China's Tianhe-1A, based at the National Supercomputer Center in Tianjin, took the supercomputing crown from America's Jaguar system at Oak Ridge National Laboratory in November 2010.

For years, the US maintained its status as the leader in the field and despite losing the top spot, it could take some solace from the fact that the Tianhe-1A was built from US technology; specifically, Nvidia GPUs. That all changed when Japan knocked the US down to third place in June 2011 with its K Computer, built from Fujitsu's SPARC64 VIIIfx processors.

It had been seven years since Japan last held the title of fastest supercomputer on Earth (in 2004 with NEC's Earth Simulator) and when the K Computer took pole position, it did so in style. It harnessed more processing power than the next five supercomputers combined, despite the fact that it wasn't even completed yet. It was commissioned by the Japanese Ministry of Education, Culture, Sports, Science and Technology with the aim of breaking the 10-petaflop barrier (the K in its name refers to the Japanese word 'kei', which means 10 quadrillion). In June 2011 the K Computer contained just 672 computer racks of its planned 800, but with 68,544 CPUs operational it still scored a LINPACK benchmark of 8.162 petaflops (quadrillion floating-point operations per second). By November 2011 the K Computer reached its goal: with 864 server racks and 88,000 CPUs, it achieved a LINPACK benchmark of 10.51 petaflops (93% of its theoretical peak speed of 11.28 petaflops).

A POWER SHIFT

Suddenly, the East's dependence on Western technology looked shaky and America's dominance was under threat. Despite still owning the majority of the supercomputers on the TOP500 list (255 in June 2011, to be exact), America's claim to being the supercomputer power was

FASTEST

The ShenWei CPU may have been reverse-engineered from the US-made DEC Alpha.

Jaguar, owned by the US Department of Energy, is America's fastest supercomputer. It dropped to number three on the TOP500 list in 2011.

TIME FOR A NEW SCORING SYSTEM

Even Jack Dongarra, the creator of the LINPACK benchmark, which is the current standard for ranking supercomputers, agrees that it isn't the best way to measure power. Dongarra is keen to start using another benchmark he originally designed for DARPA, called the High Performance Computing (HPC) Challenge. HPC Challenge completes seven performance tests to measure multiple aspects of a system. As yet, it hasn't been adopted by TOP500.

Another benchmark, the Graph 500 benchmark, has also been introduced by an international team led by Sandia National Laboratories. Its creators describe it as complementary to the one used by TOP500. However, because it produces just one number based on a single aspect of supercomputing, the Graph 500 may be open to the same criticisms as the LINPACK benchmark.

The TOP500 project recognises the limitations in the single algorithm it uses and it does its best to prevent exploitation. The web site carries a disclaimer that the TOP500 list only looks at general-purpose machines – ones that can handle a variety of scientific problems. So any system specifically designed to solve the LINPACK benchmark problem or have as its major purpose the goal of a high TOP500 ranking will be disqualified.

further questioned in October 2011 with the announcement of China's new supercomputer, the Sunway BlueLight MPP. This wasn't because it was the most powerful – it's thought to be about the 15th fastest machine in the world – but because it was built entirely from Chinese-made processors, making it the first Chinese supercomputer that doesn't use Intel or AMD chips. The arrival of the Sunway realises China's dream to sever its reliance on US technology. This isn't just rhetoric, but a stated ambition of the Chinese government. What's more, the Sunway's small size and relative energy efficiency compared to other supercomputers in the top 20 have surprised top computer scientists, and some commenters believe this is a sign that China is about to leapfrog its competitors with the next iterations of its own technology.

China's Sunway BlueLight MPP is built from ShenWei SW-3 1600 chips (16-core, 64-bit MIPS-compatible, or RISC, CPUs) that are thought to be a few generations behind Intel's current chips; however, with the large funding base provided by the Chinese government, it's unlikely that new versions of these chips are far away. ShenWei CPUs are believed to be based on China's Loongson/Godson architecture, which China has been working on since 2001. Some people believe this family of chips was reverse-engineered from the US-made DEC Alpha CPU. This may be true, but the nice thing about reverse-engineering products is that it allows you to apply hindsight – to redesign and remove all those hangovers and unnecessary artefacts from previous iterations – hence their better energy efficiency and smaller size.

As of June 2012, the US had regained dominance on the list with IBM's Sequoia supercomputer, sporting 1,572,864 cores. Prior to that, the US government had already raised questions regarding how the best supercomputer in the world is determined. These supercomputer world rankings in terms of power are all very well, but a lot of people, including President Barack Obama, have pointed out that it isn't what your

The Cray XE6 uses eight- or 12-core Opteron 6100 processors, allowing for up to 2,304 cores per cabinet.

supercomputer can do, but what you do with it. They argue that supercomputing isn't just about raw power, but how that power is used, how much electricity it consumes and how fast it is at bringing about real-world solutions to problems.

WHO DARES TO JUDGE?

So who judges which supercomputer takes the crown and what criteria do they use? Most people are happy to be guided by the TOP500 list of supercomputers (**www.top500.org**). The TOP500 project was started in 1993 and ever since then, it has produced a list of the most powerful computing devices twice a year to "provide a reliable basis for tracking and detecting trends in high-performance computing".

Assembled by the University of Mannheim in Germany, the Lawrence Berkeley National Laboratory in California and the University of Tennessee in Knoxville, TOP500 uses the LINPACK benchmark to decide which machine has the best performance. Introduced by Jack Dongarra, the LINPACK benchmark tests the performance of a system by giving it a dense system of linear equations to solve, measured in flops – basically, how many calculations per second it can perform. The higher the flops, the better the computer.

It has been agreed that this isn't the best way to measure power. Not only is it measuring only one aspect of the system, but two machines with the same processor can get different results: the performance recorded by the benchmark can be affected by such factors as the load on the system, the accuracy of the clock, compiler options, version of the compiler, size of cache, bandwidth from memory, amount of memory and

EXASCALE COMPUTING

Exascale computing is a big dream in the supercomputing world: producing a machine with 1,000 times the processing power of the fastest crop of supercomputers. Most pundits are predicting the breakthrough by the end of the decade, but there are various real-world constraints that need to be overcome first.

Technically, there's nothing stopping someone from assembling the hardware to create an exascale computer today. The problems are how much power it would consume, its mammoth size and the heat it would produce. Even today's high-performance computers would melt in minutes if you took away the cooling fans used in their ice-cold bunkers.

China's Sunway BlueLight MPP computer is leading the way in energy efficiency. Its power requirement is 1mW. In comparison, its predecessor, the Tianhe-1A, built using US technology, consumes 4mW when running and America's Jaguar uses around 7mW. That's a considerable saving in both power and running costs for a machine that's about 74% as fast as the Jaguar, especially when you consider that each megawatt translates to about $1 million a year in electricity costs. Running Japan's K Computer at its peak of 8.162 petaflops took 9.89mW. That's roughly $10 million a year.

The leap to exascale may seem a big one to make by 2020, but it will be needed to wade through all the data that will be stored by then. Eight years ago there were only about five exabytes of data online. In 2009, that much data was going through the internet in a month. Currently, the estimates stand at about 21 exabytes a month. That's not to mention all the sources of data stored elsewhere, all ripe for analysis – loyalty cards in stores, credit card data, information from weather tracking satellites, tidal flows and star mapping, to name but a few. Nowadays, data is being generated and stored everywhere, producing endless seas of statistics to wade through. Supercomputers can, and do, turn these swathes of data into useful info, analysing trends, comparing data sets, finessing product design and producing hyper-realistic simulations of systems. Exascale supercomputing will allow us to analyse our world as never before.

To find better ways to achieve better data speeds or more energy-efficient supercomputers, research centres are starting to build their supercomputers out of more unusual components. For example, the San Diego Supercomputer Center (SDSC) has built one that uses flash storage (specifically, 1,024 Intel 710 Series drives), allowing it to access data up to 10 times faster than with traditional hard drives.

At the computer's unveiling in January, Michael Norman, the director of the SDSC, said: "It has 300 trillion bytes of flash memory, making it the largest thumb drive in the world". It's a powerful thumb drive, though, ranking 48th on the TOP500. In case you're wondering, the computer is called Gordon. As in Flash Gordon.

HECToR (High-End Computing Terascale Resource) is the UK's fastest supercomputer, the 19th fastest in the world, and is capable of over 800 million million calculations a second.

so on. However, this is true of most benchmarks.

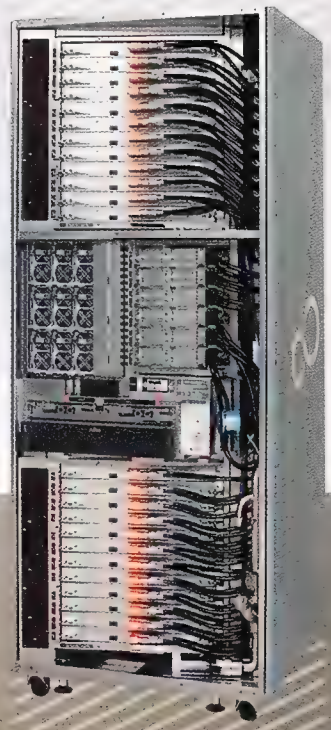
The TOP500's focus on just one measure led President Obama's Council of Advisors on Science and Technology to argue that America's position in supercomputing shouldn't be decided by this single metric. In a report in December 2010, it stated: "While it would be imprudent to allow ourselves to fall significantly behind our peers with respect to scientific performance benchmarks that have demonstrable practical significance, a single-minded focus on maintaining clear superiority in terms of flops count is probably not in our national interest."

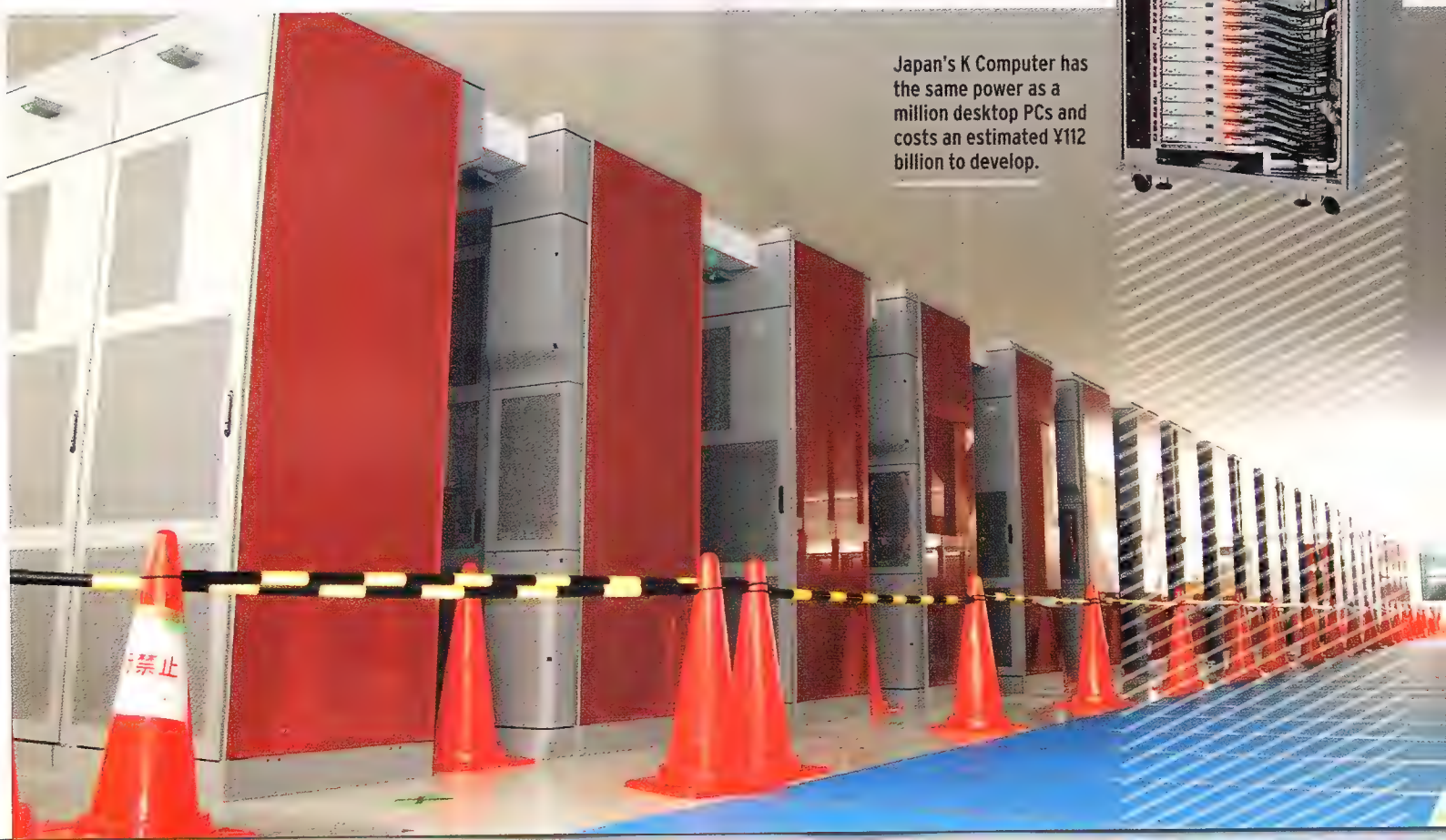
REAL-WORLD BENEFITS

One real-world benefit of supercomputers is in product design. According to Dongarra: "Supercomputers enable simulation – that is, the numerical computations to understand and predict the behaviour of scientifically or technologically important systems – and therefore accelerate the pace of innovation. Simulation has already allowed Cummins to build better diesel engines faster and less expensively; Goodyear to design safer tires much more quickly; Boeing to build more fuel-efficient aircrafts; and Procter & Gamble to create better materials for use in its home products. Simulation also accelerates the progress of technologies from laboratory to application. Better computers allow better simulations and more confident predictions. The best machines today are 10,000 times faster than those of 15 years ago, and the techniques of simulation for science and national security have been improved."

Another person who believes in the need for supercomputing is Kevin Wohlever, director of Supercomputing Operations at Ohio Supercomputer Center. He has been involved with supercomputing for almost 30 years, working for vendors such as Cray Research, Inc. We asked him whether the supercomputer race between China and the US is a matter of national pride, or if there's something more important at play. "It is both a matter of pride and something deeper. If you look back 10 to 15 years, the same questions were being asked with the Japanese versus United States supercomputer race. There is obvious national pride. There is also vendor pride for the company that designs and builds the fastest computer. There are marketing benefits from being the company or country that has and provides the fastest computer in the world."

"There are also significant benefits from the proper applications running on top-end computers," he adds. "Modelling the financial markets and making trades just that split-second faster than someone else can make a lot of money for someone. There are also implications for everything from weather modelling and designing cars, planes, boats and trains, to finding new drugs, modelling chemical reactions and





Japan's K Computer has the same power as a million desktop PCs and costs an estimated ¥112 billion to develop.

such. The right tools in the right hands can make a big difference in the level of security anyone can feel, whether that happens to be in their job or their life".

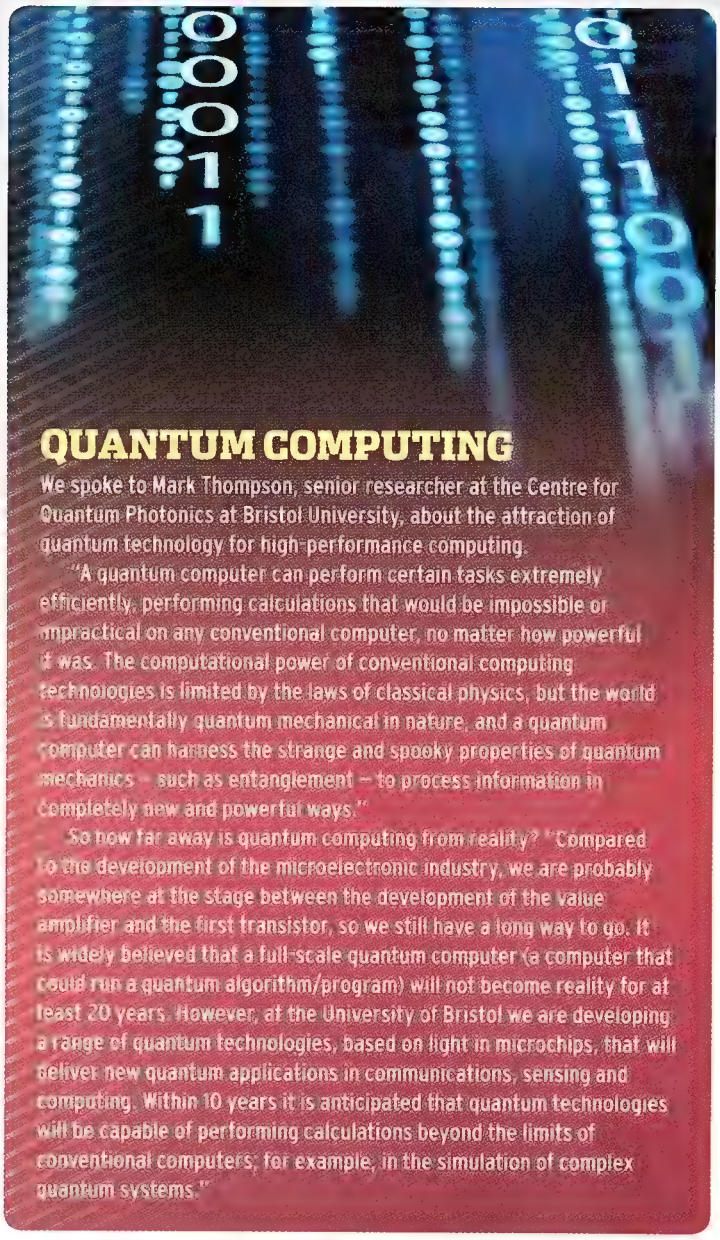
SCIENCE'S THIRD LEG

Gerry McCartney, vice president for Information Technology and CIO at Purdue University, also agrees that there needs to be more emphasis on developing supercomputers and not just to be able to say you're the best: "I would say that high-performance computing – computational modelling and simulation – is now the 'third leg' of science and engineering, alongside the traditional legs of theory and experimentation.

"So having inferior computing is exactly like having inferior laboratories or research tools. It has a direct relation on the amount, quality and speed of developments – both basic science and technological developments, which advance knowledge and science; and technological developments that drive economic growth. There's a lot more at stake than bragging rights."

With this in mind, we asked McCartney, who oversees the biggest campus supercomputer in the world, how important he feels supercomputing is in the political sphere today. "Probably not important enough," he told us. "In the United States, as well as the UK, it's facing the same problem as science, medical and other types of research generally. The economy is down, budgets are tight nationally and in the United States, at the state level. We're looking for ways to spend less, not places to spend more. Certainly, we should find ways to leverage efficiencies and spend money wisely. But we need to think long-term in doing so. Developments today, like atomic-scale silicon wires, may not pay off in a big way for a decade. But they will never pay off if you don't have the tools to begin the process."

However, despite these monetary constraints, the US isn't standing still. IBM and Cray are already developing 20-petaflop machines and despite President Obama's Council of Advisors on Science and Technology stating in December 2010 that "engaging in a [supercomputing] 'arms race' could be very costly and could divert resources away from basic research," America's 2012 budget has earmarked US$126 million for the development of exascale supercomputing, the next major milestone in supercomputer research. This compares with the mere US$24 million set out specifically for supercomputing in the previous budget. Japan has earmarked $1.3 billion for the development of its own exascale computer by 2020.



QUANTUM COMPUTING

We spoke to Mark Thompson, senior researcher at the Centre for Quantum Photonics at Bristol University, about the attraction of quantum technology for high-performance computing.

"A quantum computer can perform certain tasks extremely efficiently, performing calculations that would be impossible or impractical on any conventional computer, no matter how powerful it was. The computational power of conventional computing technologies is limited by the laws of classical physics, but the world is fundamentally quantum mechanical in nature, and a quantum computer can harness the strange and spooky properties of quantum mechanics – such as entanglement – to process information in completely new and powerful ways."

So how far away is quantum computing from reality? "Compared to the development of the microelectronic industry, we are probably somewhere at the stage between the development of the valve amplifier and the first transistor, so we still have a long way to go. It is widely believed that a full-scale quantum computer (a computer that could run a quantum algorithm/program) will not become reality for at least 20 years. However, at the University of Bristol we are developing a range of quantum technologies, based on light in microchips, that will deliver new quantum applications in communications, sensing and computing. Within 10 years it is anticipated that quantum technologies will be capable of performing calculations beyond the limits of conventional computers, for example, in the simulation of complex quantum systems."

THE ALTERNATIVES

You can build a supercomputer from solid-state drives, so why not make one from mobile phone chips? By using low-powered Tegra CPUs, typically found powering mobile phones and tablets, the Barcelona Supercomputer Center in Spain hopes to reduce the amount of electricity needed to run its new supercomputer. There's a deal with Nvidia in the offing and it hopes to produce a high-performance computer by 2014 that runs with a four to tenfold improvement in energy efficiency over the most energy-efficient supercomputers that currently exist.

Or how about building a cloud-based virtual supercomputer from the servers you have lying around idle? Servers that could be used as a supercomputer today, and something else tomorrow. A supercomputer for hire, if you will. Amazon did just that in 2011, building a virtual supercomputer out of its Elastic Compute Cloud (Amazon EC2), the worldwide network of data centres it uses to provide cloud computing power to other businesses across the world.

In fact, Amazon's global infrastructure is so vast that it could run a virtual supercomputer – one that's fast enough to be placed as the 42nd most powerful supercomputer in the world – without it affecting any of the businesses that are using its data centres for their own means. Nowadays then, you don't need to physically build a supercomputer, when all you need to do is just hire enough virtual servers to get the computational power you desire to run your particular project, and for a fraction of the price it would cost to build your own.

This form of distributed supercomputing is something China could easily reproduce and if it was to connect all its different supercomputing complexes together and then run them as a virtual supercomputer, it could easily outpace anything the US could produce by a factor of 100.

However, these are ways of employing technologies that already exist in a commercial form. The truly exciting research is based on technologies only just being tested in the lab. It's here in the development sphere that various technology buzzwords and phrases are bandied about, all of which could lay the foundation for the next generation of supercomputing. These include developments such as optical information processing, atomic-scale silicon wires and quantum computing.

OPTICAL PROCESSING

Purdue University is working on two of these technologies already. The first concerns optical information processing, where light instead of electricity is used to transmit signals, much like in a fibre optic cable.

However, although fibre optic cables can transmit a lot of data, the need to translate the data back into electronic signals at either end of the cable slows down the data transmission considerably (and opens the data up to cyber-attack). The optical processing dream is for the information carried by the light to be transmitted directly into the computer and Purdue thinks it may have found a way to do just that.

A team based there has succeeded in making a 'passive optical diode' that transmits optical signals in only one direction. As associate

Using low-power processors, such as Nvidia's Tegra 3, is one method of increasing the energy efficiency of new supercomputers.

professor of Electrical and Computer Engineering Minghao Qi explains: "This one-way transmission is the most fundamental part of a logic circuit, so our diodes open the door to optical information processing". Made from two tiny silicon rings measuring 10 microns in diameter (about a tenth the width of a human hair), they're small enough that millions can fit on a computer chip.

As well as speeding up and securing fibre optic data transmission, these optical diodes could speed up supercomputers entirely if they were used to connect the processors sitting inside the computer. As graduate research assistant Leo Varghese points out: "The major factor limiting supercomputers today is the speed and bandwidth of communication between the individual superchips in the system. Our optical diode could be a component in optical interconnect systems that could eliminate such a bottleneck."

Another breakthrough made by Purdue University, in conjunction with the University of New South Wales and Melbourne University, is the smallest wire ever developed in silicon. By inserting a string of phosphorus atoms in a silicon crystal, the research teams created a silicon wire one atom high and four atoms wide, with the same current-carrying capability as copper wires.

This could pave the way for the creation of nanoscale computational devices and make quantum computing a reality. With size being such an issue in the world of supercomputing, this research shows what could be the ultimate limit of downscaling using silicon, leading to the smallest possible silicon-based supercomputers.

KEEP PEDALLING?

With all these new technologies being employed, are we already chasing computing power for the sake of just being the best, rather than thinking of practical applications? We asked Purdue University's Gerry McCartney if supercomputing is going too fast for people to keep up with. "You have to have people who know how to build, operate and maintain these systems and, more importantly, how to work with researchers to make it as easy as possible for them to get their research done using these tools," he answered. "There's no surplus of qualified people. They're in great demand. As a university supercomputing centre, we help teach students by involving them as student employees with important roles. These students end up with multiple job choices in the industry. But our motives aren't entirely altruistic. We're able to attract some of them to our expert professional staff after they graduate."

We asked Kevin Wohlever of the Ohio Supercomputer Center if there are problems with training people to know how to use these emerging computing technologies. He said it's more a problem with educating companies on what's available. "I think that supercomputing is going too fast for some industries and companies to keep up with. The rate of change in technology overall is very fast. Very good and smart people are able to look at the new technology and take advantage of it to solve today's problems. I think the issue is that lack of acceptance and use of the new technology by the companies and people higher up in the organisations, or that have a nice profit stream from current technology, suppresses the use or widespread adoption of new technology. We do need to get some better standards in place to adopt new technology faster. I think we need to show that this is an exciting field to get into. It may not have the financial benefits of some technology or social technology companies, but there is still exciting work to be done."

This excitement is evident throughout the supercomputing industry and whatever the politics, it's clear that supercomputers are more and more necessary in our world of high-speed calculation. If the western world were to lose its dominance in supercomputing, it could potentially fall behind in many other areas of science.

However, this seems an unlikely occurrence – the race is on and it's likely to be neverending. When the prize is just to be the fastest computer in the world, there's always another contender just around the corner. The true benefits of this continued race will be seen by the consumers, as these supercomputing leviathans pave the way for the computer technologies that we'll find in our homes, cameras, tablets and phones a mere few years later, not to mention the scientific breakthroughs that faster computing speeds will make possible. It's unlikely that any government will fail to recognise the importance of supercomputing and even if that's just due to political reasons of pride and competition between nations, technology will still be the winner. abc

Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

HARDWARE

FASTER FRAPPING

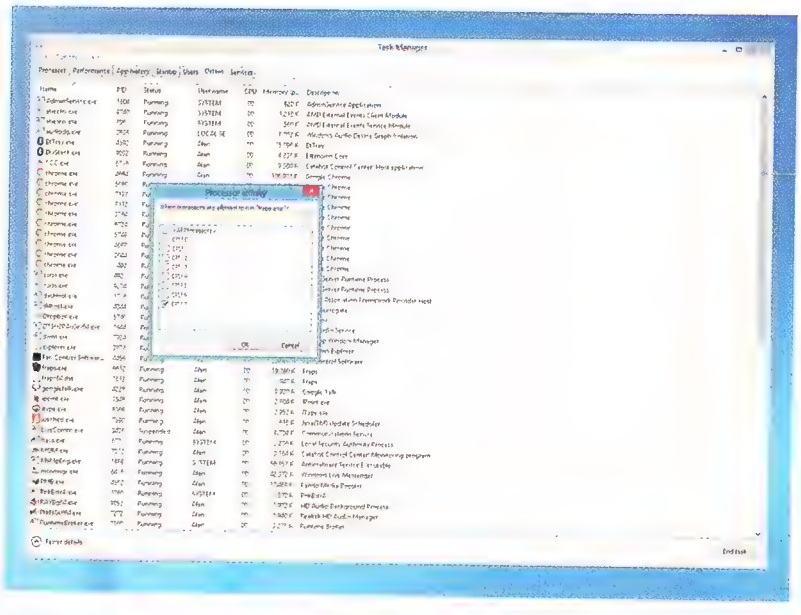
Q I have started making videos for my YouTube gaming channel. I have a Core i7-860, 16GB of RAM, GeForce GTX 570 and a 700W power supply. I would like to record in 1,920 x 1,080. When using Fraps or Dxtory I get about 16fps, but want to get 30fps. My card runs at 53° in games, four of the eight cores are hardly used and the hard drive I record on is a 5,400rpm 500GB drive. Some fellow YouTubers advised I need a faster drive. Can you advise on the best one to buy?
Russ T

A If your videos stutter, a slow hard disk may be to blame, but not necessarily. Disk writes will be buffered, both by Fraps and by the drive controller itself. When the buffer fills up, we'd expect there to be a few skipped frames as it writes the buffer to disk and then another smoother bit, when it buffers some more and so on. The skipping should also occur regardless of the amount of detail on the screen. Fraps is trying to write video at a consistent frame rate and the size of its data stream should be fairly constant, regardless of how hard your graphics card is working. If this describes the sort of slowdown you're seeing, your best bet is to get a solid-state drive (SSD) and install that as a separate drive, just for frapsing.

However, if you just see the sort of normal, 'my PC is suddenly a bit rubbish' slowdown, where quiet scenes aren't too bad and busy scenes lag terribly, then it isn't the hard disk. Rather it's the extra processor load that Fraps is taking up. On a multicore CPU, you can usually improve this by moving Fraps and the game onto separate cores.

Open Task Manager, click the 'Applications' tab, right-click 'Fraps' and select 'Go To Process'. Right-click the process that's highlighted and select 'Set Affinity'. Untick all the boxes except the last one, so Fraps is running on just one CPU core. Repeat this process with the games you're recording and make sure all the cores are selected except the last one. This will stop Fraps fighting over the same core with your game, which reduces the amount of context swapping and should improve performance.

Often games aren't optimised to run on multiple cores, so you aren't denying them a resource they were using effectively anyway.



Keep Fraps away from the cores your games are using.

POWER

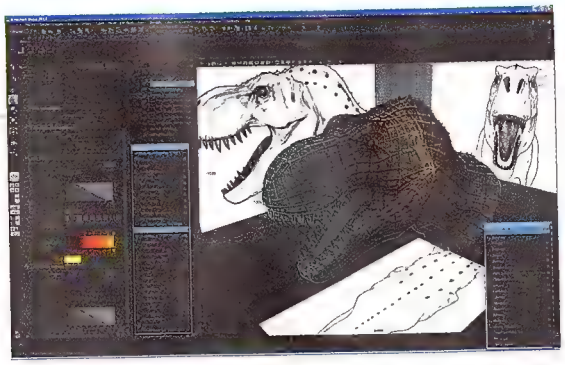
ALL ABOUT POWER

Q I recently upgraded my HP Blackbird 002 with an ASUS P9X79 Deluxe motherboard, Core i7-3820, Samsung 840 Pro SSD with a Barracuda 3TB for archive, and 16GB of Corsair Dominator Platinum 1866 RAM. I'm still using the water cooler that came with the original system and have two XFX Radeon HD 6950s in CrossFire mode. Every once in a while, the computer will trip a breaker, forcing me to switch the computer onto one circuit and have my peripherals plugged into another. My questions are these: would swapping out the three-year-old power supply for, say, a modern Corsair modular PSU be more energy efficient? Is 1,100W overkill for my system as listed above? Would I be better served with an 860W PSU? If I swap out PSUs, can I use the existing modular power cabling or is that just a bad idea?
Matthew Bryington

A Yes, a modern power supply should be more efficient than the behemoth that came with the Blackbird. You mentioned Corsair and an 860W PSU, so you've clearly been doing some research. Corsair's AX860 PSU is 80 Plus Platinum certified, so it's very energy efficient. It's also fully modular and it should provide more than enough power.

To answer your third question, no, you can't use the same modular power cabling. It won't fit and even if it did, it's a bad idea. Take the opportunity to do a fresh rewire. Even though new PSUs don't have that 10-pin power connector for the SATA backplane, HP in its wisdom enabled the backplane to be powered by one four-pin Molex connector or two SATA power connectors instead.

That backplane will work just fine for your current drives, even the SSD, if you get a 3.5in-to-2.5in adapter that fits. The backplane is just a straight pass-through and you'll still get 6Gbps SATA speeds out of a 6Gbps SATA drive, as long as it's plugged from the backplane into a 6Gbps SATA port. You didn't ask, but we thought we'd mention it anyway, since we had to figure this out recently.



Want to create beautiful things in Maya? Focus on that, not on your PC.

STORAGE

DATA RECOVERY FROM LAPTOP RAID

Q I have an MSI GT683 laptop with two 500GB hard drives in RAID 0. My motherboard failed under warranty. The laptop isn't worth repairing, so they're sending me a new laptop. The new one is an MSI GT783R with two 750GB hard drives in RAID 0. The techs sent back the drives from the old laptop in the hopes that I could recover data from the RAID. Could someone explain how to remove the data from two hard drives in RAID 0 and reinstall on my new laptop? I have a standalone hard drive dock used to clone hard drives and also an adapter used to transfer information from one hard drive to another. Unfortunately, neither device works in my situation. How do I get the data from my old drives?

Dan Tiefenbach

A It's difficult to restore data from a RAID without using the same chipset/RAID controller as was used to create it. However, given how similar the new laptop is to the old one, you may be in luck. Since you were able to remove the drives from your old laptop, you ought to be able to do the same on your new one. And since both are Sandy Bridge laptops in the same general product line from the same vendor and both use the same HM67 chipset, your old RAID should be visible on the new computer once you have enabled it in the BIOS.

Replace the 750GB drives in the new laptop with the 500GB drives from the old laptop. Hopefully, the RAID will be recognised and you can boot from the drives. If so, copy the data you need to an external drive. Then remove the 500GB drives and replace the 750GB drives in the same configuration they were in when you got the new laptop, and move the recovered data to the new laptop. If you're feeling a bit skittish about swapping the drives, you can try file recovery software such as QueTek's File Scavenger (**www.quetek.com**). We've long been fans of File Scavenger as a recovery tool, so it's highly recommended.

GAMING

NOT SO FAST

Q My new gaming computer has slowed right down and I have no clue why. I used to be able to run *Team Fortress 2* at maximum settings, full AA, at 1,920 x 1,080. After a while (about a month), it just stopped being so fast. Now it can't even handle the lowest settings in 1080p and anything below 1080p looks terrible on my monitor. Are there any test things I can do to help you find the problem?

Will Knight

A This will make you laugh. We built a little gaming PC before Christmas, specifically to run *Guild Wars 2* (we're monomaniacs and like to keep each game on its own computer. Luckily, we rarely allow more than two or three games into our lives at a time.)

We were perfectly satisfied with it until we did a quick benchmark comparison for another project and discovered the *Guild Wars* PC was running more slowly than the *Kerbal Space Program* PC, even though it should have been higher spec. We spent 40 minutes tweaking settings and updating drivers before we discovered that the HDMI cable was plugged into the onboard graphics chip, rather than the $450 graphics card. Yeah. Not sure how that happened.

So check that. Other tests include opening Task Manager to see what other things are running at the same time and checking the BIOS setup page to make sure that all the RAM you think you have installed is actually detected correctly.

Ultimately, it will be something simple like that. It's counter-intuitive, but big slowdowns are much easier to diagnose than small ones because they have to be caused by something significant. And significant is usually obvious. Check your performance in other games. Run the Windows Experience Index ('Control Panel > System and Maintenance > Performance Information and Tools'). If it's slow for everything, not just *Team Fortress*, you should definitely check your power supply. Have you added anything that might be drawing enough extra power to overload the PSU?

SYSTEMS

ANIMATION PC

Q I'm pursuing my career in animation and to help me I am thinking of a specialised build as opposed to buying a high-end PC. My budget is rather restricted as the course itself is a hefty amount. Seeing that I'll utilise software like Adobe's Creative Suite and 3D rendering software like Autodesk Maya, can you suggest a solution?

Dylan De Beer

A Our suggestion is that you don't build a specialised homebrew computer right now. First reason being, you're a student and therefore you need to be spending your time studying long words in big books and figuring out how to be an effective and fully socially integrated person. There'll be plenty of time to spend alone in your room fiddling with drivers and cooling fans when you're an unemployed graduate.

The second reason is that the specialised requirements of your animation computer also map quite nicely to the requirements of a gaming PC. A name-brand, mid-range gaming PC will do everything that a self-built PC will, except that you won't have to put it all together yourself. In the event that it breaks, you'll also have a single warranty instead of one for each component. We like building PCs, but it's a hobby, definitely not a time-efficient way of getting a new computer.

CONTACT@APCTEST.COM Share your tech tips

Have you solved a tech problem or found a better way of doing things with your computer? Share your information with other APC readers by sending it in as a tip to contact@apctest.com, together with your name and contact details (details won't be printed). Alternatively, if you have a technical question post it online on our forums at apcmag.com/forums and other readers may be able to solve it.

Upscale with downsampling

Ashton Mills explains how downsampling reduces aliasing and increases the visual fidelity of textures in your games.

WHAT ABOUT AMD?

We only have space to cover the Nvidia procedure here, but AMD cards can downsample too. The process is little different, but you'll find a number of guides online. Check out **tinyurl.com/croy6xh** for a good place to start.

One problem has plagued gamers since *Pong* first plied its pixels on our TVs all those years ago (well, if you're as old as me perhaps) – the display can only reproduce a certain level of image fidelity based on resolution. As we moved from TVs to CRTs to LCDs: the latter especially, given their accurate display of pixels – we started to notice a phenomenon affectionately called 'jaggies', but which is technically known as 'aliasing'.

Aliasing, in the display sense, is the result by which lines and curves appear jagged due to the display's resolution being unable to fully reproduce them. Today's standard desktop display is 1,920 x 1,080 (aka 1080p), which may seem like a lot, but is still low enough that jaggies can be seen on most surfaces in a game. Even higher-resolution displays, such as 2,560 x 1,600 aren't immune, although as you might expect, the higher resolution and therefore the greater granularity to represent lines and curves reduces the effect. Ultimately, until we have monitors with resolutions that become indistinguishable to the human eye, all displays are unfit to the task.

This is why games and GPU drivers have for many years provided various forms of antialiasing, the most common of which is MSAA (multisample antialiasing). Antialiasing works by blurring the edges of lines and curves to make them seem smoother or softer and the science behind it is as interesting as it is complex: the challenge is often about how to determine what a line is and isn't onscreen to effectively antialias only those edges that need it and not to blur those that don't. There are various options including the more recent innovations of fast yet less accurate shader methods like FXAA (fast approximate antialiasing) and SMAA (subpixel morphological antialiasing) through to the traditional albeit slower CSAA (coverage sample antialiasing) and MSAA to name just a few. To make it even more interesting, you can sometimes combine multiple methods.

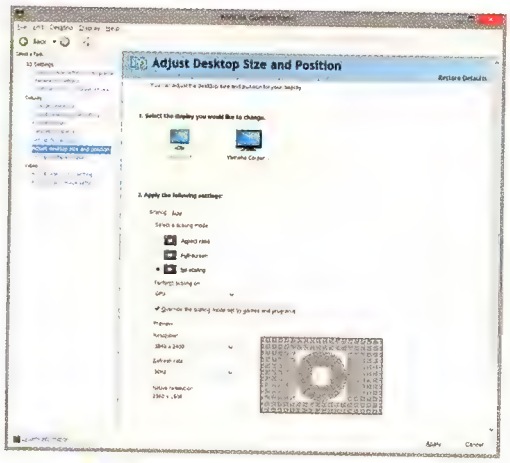
But there is another option. Downsampling, while not technically new, has been growing in popularity, particularly as newer and faster GPUs are released. Downsampling isn't an AA method per se, but it does reduce jaggies as a natural side-effect. It can be just as demanding if not more so than traditional AA modes, but it will often work on games that don't properly support AA. Downsampling has the added benefit of not just reducing aliasing, but also increasing the visual fidelity of textures at the same time.

THINK BIG

Downsampling is simple in process: tell your GPU to render a game at a higher resolution than your display and then downscale it to fit. If you have a 1,920 x 1,080 monitor for example, you can render a game at 2,560 x 1,440 on the GPU internally and downscale to fit 1,920 x 1,080. As pixels are interpolated, antialiasing is a natural benefit, but whereas traditional antialiasing modes like MSAA target jaggies and not much else, downsampling involves the whole image. Jagged lines within textures themselves, including artefacts like spatial aliasing that traditional AA modes can't fix, are improved and the entire image appears to contain a higher visual fidelity – textures are rendered at a higher level of detail, such as discerning the pattern on a piece of armour or finding the markings on a weapon visually sharper. Once you try downsampling it's hard to go back.

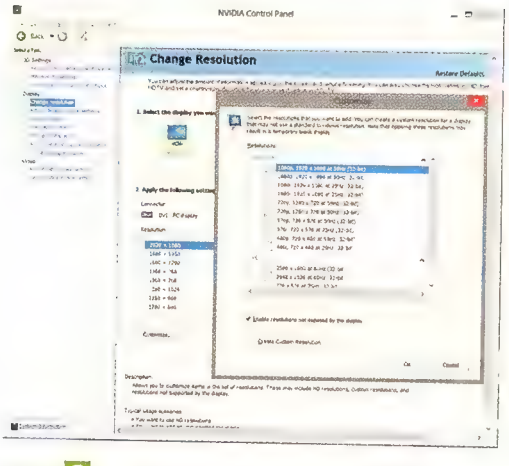
SETTING UP DOWNSAMPLING

The process is actually quite simple, but may require some trial and error.



STEP 1

Right-click on the desktop and load the 'Nvidia Control Panel'. Click on 'Adjust desktop size and position' and in the 'Scaling' tab, select 'Aspect Ratio'. For the field 'Perform scaling on:' choose GPU. Finally, tick the box marked 'Override the scaling mode' and click 'OK'. Later you can try experimenting with display-based scaling; either should work fine.



STEP 2

Next, click on 'Change resolution'. Make sure your current resolution is selected and click on 'Customize'. A box will appear of known resolutions. Ensure 'Enable resolutions not

1,920 x 1,080, NO AA

1.5x, NO AA

2.0x, NO AA

2.0x, 4x AA

Note the increased texture detail as we increase the downsample resolution. In all cases the image being displayed is still 1,920 x 1,080, but at 2x downsampling the texture is being rendered at 3,840 x 2,160 internally before being downsampled to 1,920x1,080.

Here we see how downsampling can both increase texture quality, as with the legibility of the text on the sign, and decrease aliasing, as can be seen on the metal bars.

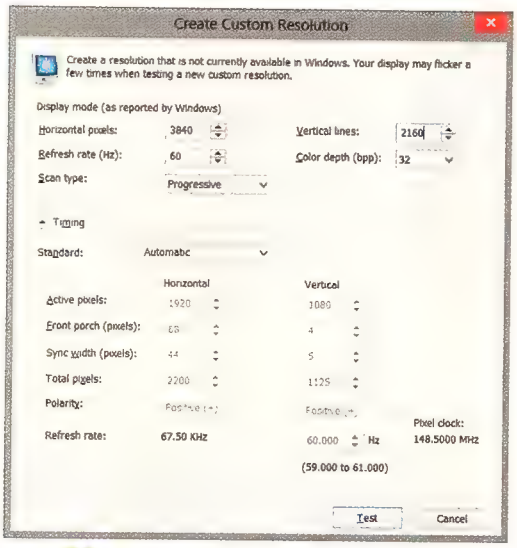
1,920 x 1,080, NO AA

1.5x, NO AA

2.0x, NO AA

2.0x, 4x AA

exposed by the display' is ticked and then click the 'Create Custom Resolution' button.

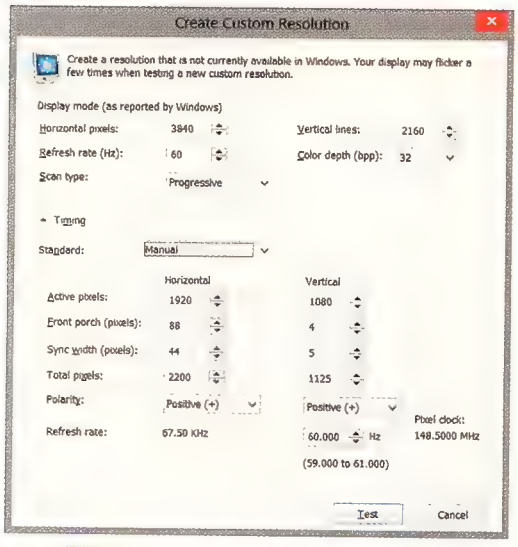


STEP 3

In the 'Display Mode' box, enter the horizontal and vertical lines of the resolution you want to downsample from. It's a good idea to start small and create higher resolutions as you go until you find the limit for your system. So, first enter values that equal a 1.25x increase in resolution; thus if your current resolution is 1,920 x 1,080, you'd enter 2,400 and 1,350 respectively. Hit the 'Test' button.

Here one of two things will happen: it will work and you'll be asked to save the resolution, or it won't. Your screen may go black or you may see odd scan lines or colours. If this happens, press the Esc key *once* and your default resolution will be restored.

If 1.25x was accepted, now try 1.5x (2,880 x 1,620 for a 1,920 x 1,080 display) followed by 1.75x and then a 2.0x. Both 1.25x and 1.5x should work fine for almost everyone, but some configurations of GPU and monitor may refuse to do 1.75x or 2.0x. The reason for this can be varied, but usually it's either the monitor EDID information (Extended Display Identification Data) isn't happy with your chosen resolution, or there's a limitation on the bandwidth for connection type you're using – HDMI is faster than single-link DVI, for example, while dual-link DVI is faster than HDMI and DisplayPort is faster than both. If your drivers think a given resolution is beyond the bandwidth your link provides, it won't let you test the resolution.


Create Custom Resolution
Create a resolution that is not currently available in Windows. Your display may flicker a few times when testing a new custom resolution.
Display mode (as reported by Windows)
Horizontal pixels: 3840
Vertical lines: 2160
Refresh rate (Hz): 60
Color depth (bpp): 32
Scan type: Progressive
Timing
Standard: Manual
Horizontal
Vertical
Active pixels: 1920 1080
Front porch (pixels): 88 4
Sync width (pixels): 44 5
Total pixels: 2200 1125
Polarity: Positive (+) Positive (+)
Refresh rate: 67.50 KHz
Pixel clock: 148.5000 MHz
60.000 Hz
(59.000 to 61.000)
Test
Cancel

STEP 4

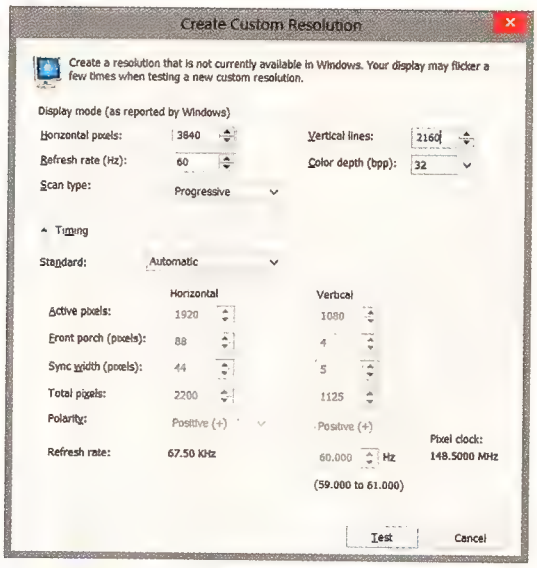
If a resolution doesn't test, all is not lost. There are two ways you can try to get your resolution working. The first involves the refresh rate, which is a function of bandwidth, so reducing it reduces bandwidth. If you set a rate of 30Hz instead of 60Hz, for example, bandwidth is halved. Of course, this then limits you to 30fps, which isn't ideal, although creating a 30Hz profile can be useful to see if the issue is bandwidth related and then you can raise it until you find an acceptable limit. If you don't mind slightly less than 60fps, just dropping to 58Hz may be enough to let your resolution work.

The other option is more time consuming. You can also reduce bandwidth by setting 'Standard' under the 'Timing' box to 'Manual' and then adjusting the 'Total pixels' fields near the bottom for horizontal and vertical pixels.

Think of the resolution you enter under the 'Display Mode' box to be your rendering resolution and the active pixels in the 'Timing' box as your display resolution. The 'Total pixels' field represents the actual resolution sent to the monitor and you should note that this is always larger than the active pixels. It can be a bit of pot luck, but you can reduce these values and regain bandwidth, which may allow your chosen 'Display Mode' box resolution to be accepted.

To do this, first ensure the 'Display Mode' resolution is native (ie. both 'Display Mode' pixels and 'Active pixels' are 1,920 x 1,080) and then, starting with horizontal pixels for the 'Active pixels' field, lower it in increments of 10 or so, testing each time. Keep going until the mode no longer works and then back off and find the limit where the mode still tests successfully. Then do the same for vertical pixels.

Once you've found your lower limit for both, enter your designed rendering resolution (again, such as 3,840 x 2,160) in the 'Display Mode' box fields and test. With luck, your chosen resolution may now work.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Create a resolution that is not currently available in Windows. Your display may flicker a few times when testing a new custom resolution.
Display mode (as reported by Windows)
Horizontal pixels: 3840
Vertical lines: 2160
Refresh rate (Hz): 60
Color depth (bpp): 32
Scan type: Progressive
Timing
Standard: Automatic
Horizontal
Vertical
Active pixels: 1920 1080
Front porch (pixels): 88 4
Sync width (pixels): 44 5
Total pixels: 2200 1125
Polarity: Positive (+) Positive (+)
Refresh rate: 67.50 KHz
Pixel clock: 148.5000 MHz
60.000 Hz
(59.000 to 61.000)
Test
Cancel

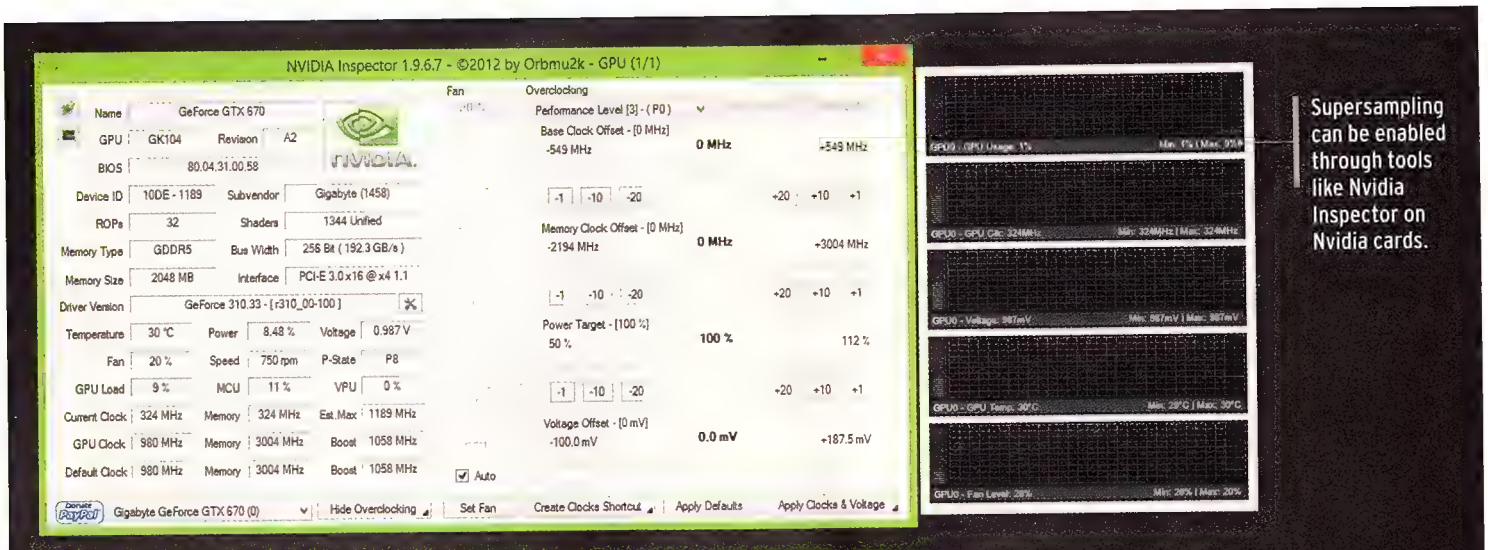
STEP 5

Any resolutions that test successfully will prompt you and ask if you want to save them. Click 'OK' and they should then show up in the 'Custom resolutions' dialogue. If not, make sure they're ticked. These should now show up automatically in any game you play – go into the game's 'Video settings' and select to change the resolution.

Note that if you made any 30Hz settings, these probably won't show up in your game's options, even though the mode tested fine and was saved. Generally, only modes close to 60Hz will show up and so the solution here is to create a custom driver file for your monitor, setting the lower boundary for refresh down to 30Hz (this is beyond the scope of this tutorial, though).

However, you likely don't want to be playing at 30fps, so while it's useful to create 30Hz profiles to test the limits of your setup, in practice the profiles you want to use should be close to 60Hz.

This leads us to those of you with faster 120Hz monitors – can you create 120Hz profiles for downsampling? Absolutely, as long as there's enough bandwidth. Generally there won't be for very high resolutions and 120Hz, but you can usually get away with 1.25x or 1.5x sampling at, say, 100Hz or 75Hz, either of which will provide faster 100fps and 75fps respectively (assuming your GPU can render the higher resolution and maintain frame rates) than 60Hz-bound monitors.


NVIDIA Inspector 1.9.6.7 - ©2012 by Orbmu2k - GPU (1/1)
Name GeForce GTX 670
GPU GK104 Revison A2
BIOS 80.04.31.00.58
Device ID 10DE - 1189 Subvendor Gigabyte (1458)
ROPs 32 Shaders 1344 Unified
Memory Type GDDR5 Bus Width 256 Bit (192.3 GB/s)
Memory Size 2048 MB Interface PCI-E 3.0 x16 @ x4 1.1
Driver Version GeForce 310.33 - [r310_00-100]
Temperature 30 °C Power 8.48 % Voltage 0.987 V
Fan 20 % Speed 750 rpm P-State P8
GPU Load 9 % MCU 11 % VPU 0 %
Current Clock 324 MHz Memory 324 MHz Est. Max 1189 MHz
GPU Clock 980 MHz Memory 3004 MHz Boost 1058 MHz
Default Clock 980 MHz Memory 3004 MHz Boost 1058 MHz
Fan
Overclocking
Performance Level [3] - (P0)
Base Clock Offset - [0 MHz]
-549 MHz
0 MHz
+549 MHz
Memory Clock Offset - [0 MHz]
-2194 MHz
0 MHz
+3004 MHz
Power Target - [100 %]
50 %
100 %
112 %
Voltage Offset - [0 mV]
-100.0 mV
0.0 mV
+187.5 mV
Auto
Gigabyte GeForce GTX 670 (0)
Hide Overclocking
Set Fan
Create Clocks Shortcut
Apply Defaults
Apply Clocks & Voltage

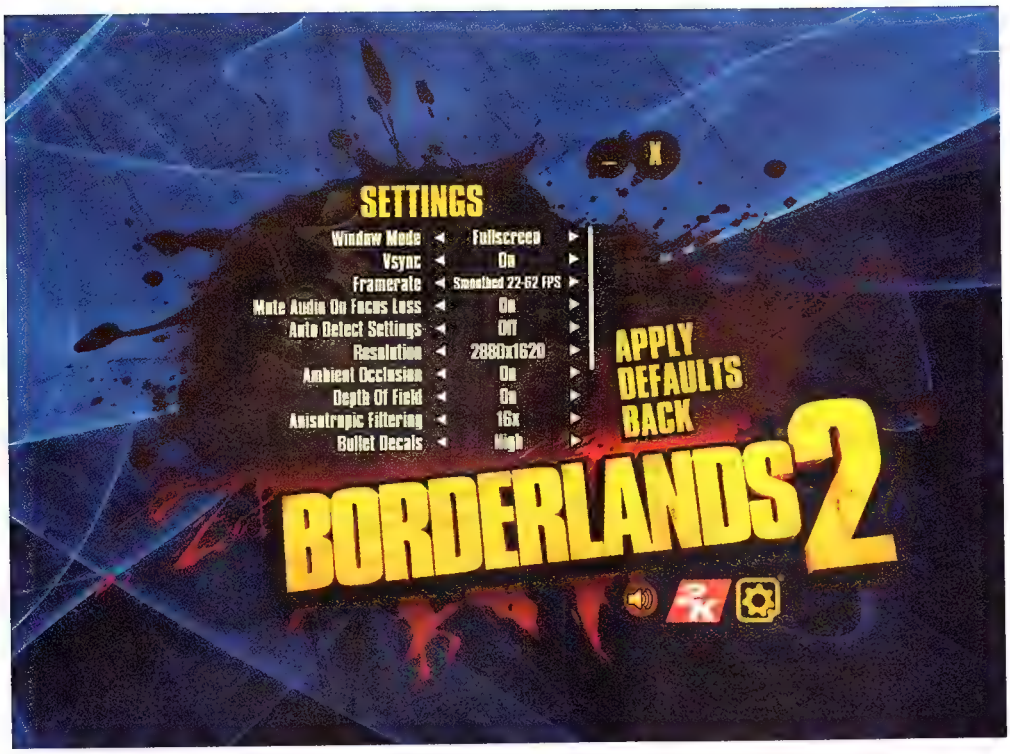
Supersampling can be enabled through tools like Nvidia Inspector on Nvidia cards.

AN ALTERNATIVE METHOD

Technically, downsampling is a brute-force method of an AA technique called 'supersampling' (SSAA). Supersampling, at least on Nvidia cards, can be enabled through tools like Nvidia Inspector (*tinyurl.com/agxm64t*). For example, 2x2 SSAA will quadruple the internal rendering resolution for horizontal and vertical pixels, and there are even modes that let you combine SSAA and MSAA for an even greater result, much like we covered here with the benefits of adding MSAA to downsampling.

So, why not just use SSAA instead of downsampling? Well, while using SSAA might be easy to set up via Nvidia Inspector, downsampling will work on any game. SSAA, like any other AA mode, may clash with a game's own rendering pipeline for AA and so, for instance, if forcing driver-based MSAA doesn't work for a game, then SSAA won't either.

The other advantage is that the benefit of SSAA is applied only to edges, like other AA methods. However, textures remain rendered at the standard resolution. In our testing, SSAA didn't increase the visual fidelity of textures the way downsampling does. Still, it's always good to have options!



Once a resolution has been tested and saved, it will show up as available in a game's graphics settings.

When it works, downsampling provides impressive results. Once it's set up you can use it in any program or game you choose. There are, however, some caveats when downsampling.

DOWNSAMPLING CAVEATS

Firstly, by its very nature downsampling is demanding: rendering a game at 3,840 x 2,160 is going to be more taxing on your GPU than 1,920 x 1,080. In fact, if your system can't maintain a smooth 60fps at 1,920 x 1,080 in a given game, then it's going to crumble at a resolution like 3,840 x 2,160. Remember, if you 2.0x scale, you're doubling both the horizontal and vertical resolution, a four-fold increase in the number of pixels. However, every game is different, so while it may not work well with one game it might work fine for others.

Secondly, as noted earlier, downsampling is dependent on your monitor. Some monitors are fussy and don't like you messing around with resolutions, even though technically all the work happens on your GPU. Since GPUs read capability data from the monitor itself, some monitors are simply more friendly to downsampling than others. The beauty is there's no harm in trying.

Finally, there's the fact that often elements like a game's UI get smaller as a resolution increases. This may or may not be an issue depending on the game, and some games naturally scale the UI with resolution, but many don't. Like everything else, it's something to decide on a case-by-case basis.

Despite these caveats there's also some good news – because downsampling naturally antialiases, you can regain some performance by disabling AA in your drivers or in the game. However, as AA operates on the rendered image, and with higher resolutions there's more data to work with, you can achieve even greater visual fidelity by combining downsampling with a little AA if you have GPU performance to spare. Even just 2xMSAA on top of downsampling can produce beautiful images and 4xMSAA even more so.

Ubuntu 13.04 preview

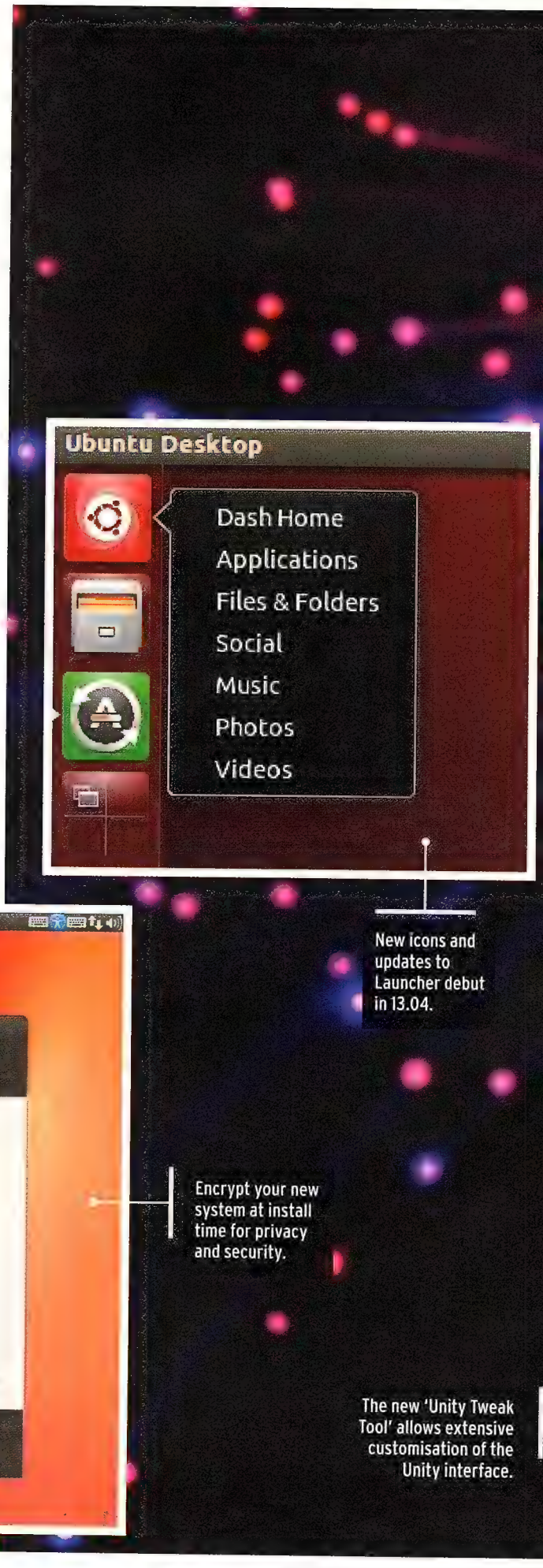
The next Ubuntu release is upon us — and it's the last. Ashton Mills investigates a new dawn for Ubuntu.

CORRECTION

In *APC* March, 'Steam for Linux arrives' (page 82), there's an error in the graph on page 85. The Linux OpenGL result for *Team Fortress 2* was listed as an 'Average' of 52. The actual result was 117, which should align more consistently with the discussion of the scores under the heading titled 'The results'. Additionally, for both *Team Fortress 2* benchmarks (Windows and Linux), the 'Higher is better' footnote is true for the 'Average', but for the 'Variability' score, lower is in fact better.

The upcoming Ubuntu 13.04 brings with it a raft of changes, not the least of which is a change in how Ubuntu itself will be unleashed upon the world. Or not, as the case may be.

Users of distributions like Gentoo will be familiar with the 'rolling release' model, which instead of regular scheduled releases of a distro, allows you to update it incrementally on the fly and as you go, indefinitely. While it's still to be officially announced, it's all but set in stone that Ubuntu 13.04 will be the last standard release of Ubuntu, after which it will move to a rolling release model. There are still some caveats being ironed out and it doesn't mean version numbers will be gone, but if it works anything like Gentoo, there'll be refreshed versioned installers for new systems while current systems will simply trickle over as updates are released. This is somewhat different to the distro-upgrade feature of Ubuntu that previously allowed you to upgrade versions in place (and would frequently cause problems – perhaps one reason for moving to rolling releases). On the whole, it doesn't mean that much to end users if you regularly update your system.


Ubuntu Desktop
Dash Home
Applications
Files & Folders
Social
Music
Photos
Videos
New icons and updates to Launcher debut in 13.04.
Install
Installation type
This computer currently has no detected operating systems. What would you like to do?
Erase disk and install Ubuntu
Warning:
Encrypt the new Ubuntu installation for security
Use LVM with the new Ubuntu installation
Something else
Encrypt your new system at install time for privacy and security.
The new 'Unity Tweak Tool' allows extensive customisation of the Unity interface.

By the time of release, up to 100 new 'scopes' for online searching are set to be included.

Much like previous milestones, 13.04 also includes a gamut of bug fixes, changes and additions. This release is somewhat more distinct than the incremental polishing that led to 12.10, so here are some of the highlights.

NEW IN TOWN

Among the usual polish, a number of UI elements have received an overhaul including new Launcher icons (some of which now clearly delineate a purpose, such as the file manager and 'Software Update'); new Alt-Tab switcher graphics to more clearly identify the selected task; a new test dialogue for mouse and touch; a new taskbar menu for the Ubuntu One that allows quick access to features like sharing a file; a shiny new 'Shutdown/Reboot' dialogue box that perhaps heralds the direction Ubuntu is travelling in terms of style and ease of use; and finally – perhaps borrowing from Ubuntu derivatives like Mint – the 'Software Update' is now more human-friendly and breaks down updates by category, rather than lumping them into one giant list.

Much more prominent, however, is the replacement of Nautilus as the file manager. Instead, a completely new file manager appropriately, and perhaps unimaginatively, called Files is present. It looks much the same as Nautilus, but integrates more directly with Ubuntu's theme and sports the ability to 'Restore missing files', though this just directly launches the 'Deja Dup' restore dialogue. It's slightly easier to use in the sense that you can do things like switch views between icon or list view easier, but it also – for us at least – seemed to be considerably less zippy.

Naturally, a new version of Ubuntu sports a new kernel and this time the latest official 3.8 release incorporates a range of additions and changes. These include Ext4 being able to embed small files within inodes, making more efficient use of disk space; the addition of F2FS, Samsung's new SSD-optimised file system; and improved ACPI power management support, among the usual collection of bug fixes and driver updates.

DASHING THE DASH

The dash underwent some scrutiny in 12.10 due to its online search result inclusion, which involved sending text typed into the search box to sources like Amazon. Far from disappearing, this feature is being expanded in 13.04 to include up to 100 new sources according to Canonical, in an effort to make Ubuntu more helpful for finding what you want online. Assuming, of course, you want to be searching online.

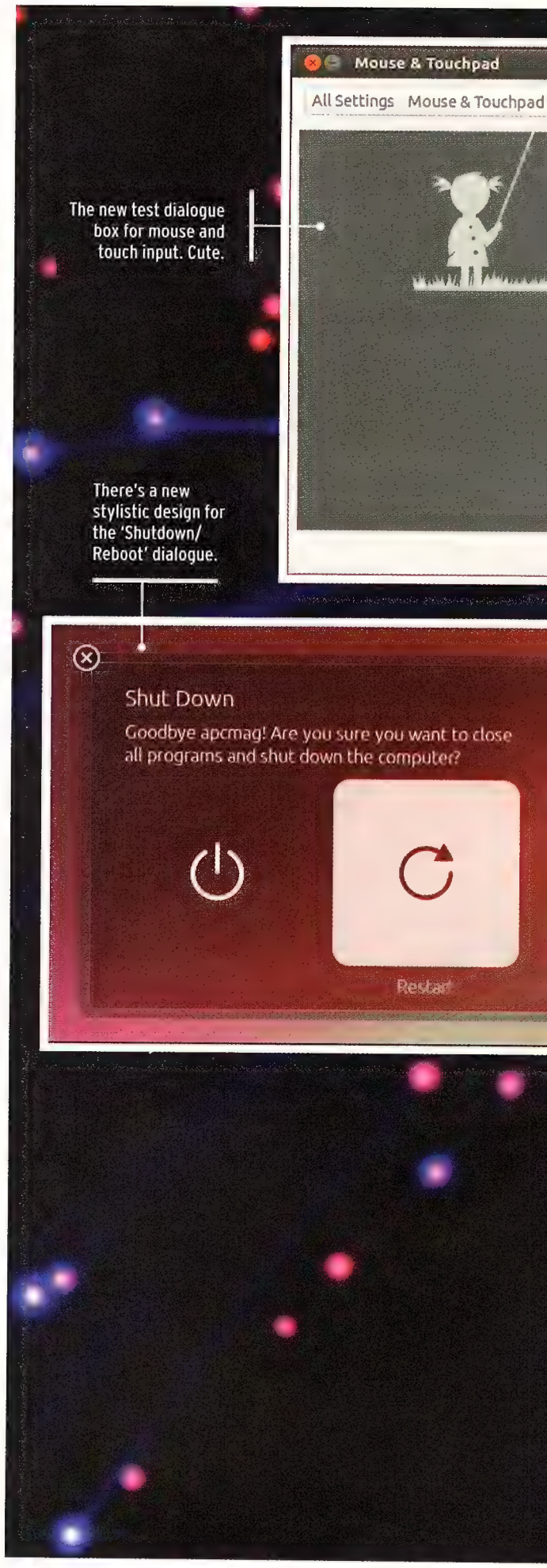
These new sources, known as 'scopes', are set to include eBay, IMDb, various weather channels, DeviantArt, Reddit and more. In order to reduce clutter and make the dash speedy, a 'Smart Scope' service attempts to determine if a search is relevant to a particular scope. Relevancy is learned via user behaviour anonymously collected online via Canonical servers, which is effectively crowdsourcing relevancy. Hmm... could be useful, but can you turn it off? There still remains an option under 'Privacy' in 'System Settings' to not include online search results. Additionally, although we couldn't find the option on this beta, the final release should provide for disabling individual scopes if you only want some sources used. Perhaps to allay fears, a legal disclaimer of what is and isn't sent is now both accessible from the dash itself and from the 'About This Computer' dialogue.

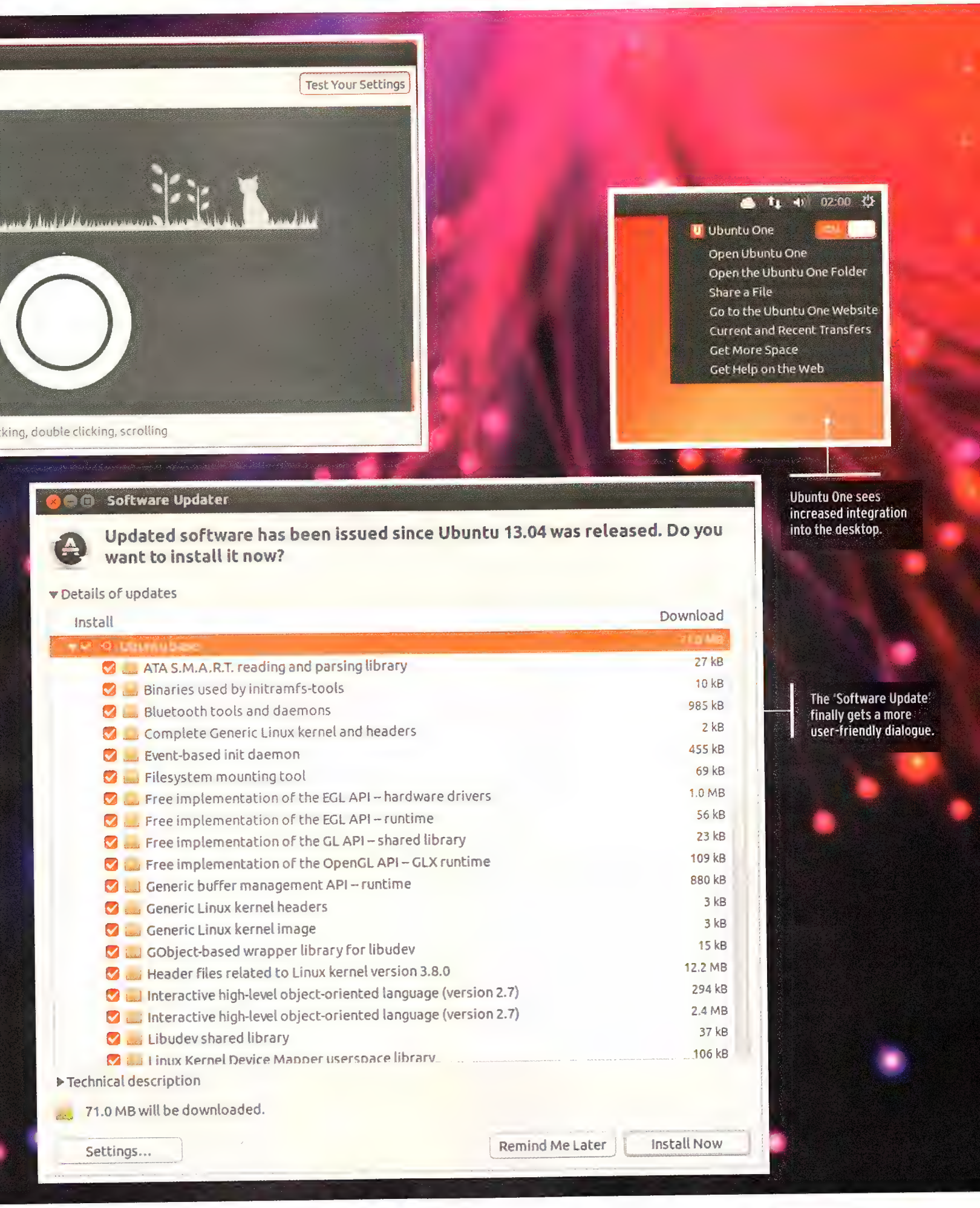
In another interesting change, multiple workspaces have been disabled by default, but can be re-enabled along with the corresponding Launcher icon to switch desktops. Perhaps this is a response to the focus on tablet and mobile, but it would be good if this was still the default for desktop versions of Ubuntu. At least the 'Workspaces' Launcher icon now updates to show you which workspace you're currently in and there's a 'Show desktop' Launcher icon that can be added to minimise all windows and reveal the desktop.

OTHER UPDATES

Firefox, Thunderbird, LibreOffice and the usual suspects are upgraded to the latest versions and although it's not installed by default, a new 'Unity Tweak Tool' can be found in the 13.04 Ubuntu Repositories (just type **apt-get install unity-tweak-tool** to try). This is quite a neatly designed tool that finally exposes some of the inner settings of Unity and allows you to tweak it to your liking. And it's no small hack-and-grab – there are 20 categories to tailor, many having numerous options you can play with in each.

On the whole, 13.04 continues to finetune the Ubuntu experience just as you'd expect and the interface looks and feels as good as it ever has (though we'll wait to see how 'Files' develops). If you left Ubuntu because of this, Unity 13.04 may be a good opportunity to give it another go. Ubuntu 13.04, aka Raring Ringtail, is out now.


Mouse & Touchpad
All Settings
Mouse & Touchpad
The new test dialogue box for mouse and touch input. Cute.
There's a new stylistic design for the 'Shutdown/ Reboot' dialogue.
Shut Down
Goodbye apcmag! Are you sure you want to close all programs and shut down the computer?
Restart


Test Your Settings
king, double clicking, scrolling
02:00
Ubuntu One
Open Ubuntu One
Open the Ubuntu One Folder
Share a File
Go to the Ubuntu One Website
Current and Recent Transfers
Get More Space
Get Help on the Web
Ubuntu One sees increased integration into the desktop.
Software Updater
Updated software has been issued since Ubuntu 13.04 was released. Do you want to install it now?
Details of updates
Install
Download
ATA S.M.A.R.T. reading and parsing library 27 kB
Binaries used by initramfs-tools 10 kB
Bluetooth tools and daemons 985 kB
Complete Generic Linux kernel and headers 2 kB
Event-based init daemon 455 kB
Filesystem mounting tool 69 kB
Free implementation of the EGL API -- hardware drivers 1.0 MB
Free implementation of the EGL API -- runtime 56 kB
Free implementation of the GL API -- shared library 23 kB
Free implementation of the OpenGL API -- GLX runtime 109 kB
Generic buffer management API -- runtime 880 kB
Generic Linux kernel headers 3 kB
Generic Linux kernel image 3 kB
GObject-based wrapper library for libudev 15 kB
Header files related to Linux kernel version 3.8.0 12.2 MB
Interactive high-level object-oriented language (version 2.7) 294 kB
Interactive high-level object-oriented language (version 2.7) 2.4 MB
Libudev shared library 37 kB
106 kB
Technical description
71.0 MB will be downloaded.
Settings...
Remind Me Later
Install Now
The 'Software Update' finally gets a more user-friendly dialogue.

Stop the worst resource-hogging apps

Quickly disable and re-enable resource-hungry apps. Simon Chester shows you how.

YOU'LL NEED THIS

AUTORUN MANAGER
Download the free version from **tinyurl.com/dx9hhb4**.

TITANIUM BACKUP
Assign labels using this app. It's free from **tinyurl.com/78v2sg6**.

In Autorun Manager 'Basic Mode', apps that say 'running' run at startup.

As you can probably imagine, I install a lot of apps – I usually have around 150 installed on my phone. Unsurprisingly, most of these are rarely used. Is this because of a nostalgic hoarding mentality? Or the belief that one day, an app's specific use case will pop up as part of a crisis situation and I'll be able to quickly emerge from the crowd, brandishing my phone and triumphantly shout "I have an app for that!"? I can't say for sure.

Having so many apps installed can affect the performance of my phone. Not all apps lie there, dormant, waiting for me to open them; many of them run services in the background or launch at startup. Worse, they can even periodically poll a server, costing precious battery life.

So, what to do? There are two approaches. If you've not rooted your phone, you only have one choice: download an app like Autorun Manager (free or $3.74 for the Pro version) and run it in 'Basic Mode'. This will list all the apps on your phone that run at boot, giving you the option to kill them after they start (doing this only works with apps that don't relaunch themselves and may cause the app to go a little crazy).

If your phone is rooted, you can use Autorun Manager's 'Advanced mode', which displays a list of all the apps on your phone that are registered for system-wide events (intents) – and thus usually run a service – and allows you to disable these intents. This is dangerous territory and can cause apps to malfunction, so isn't my preferred way to go about things.

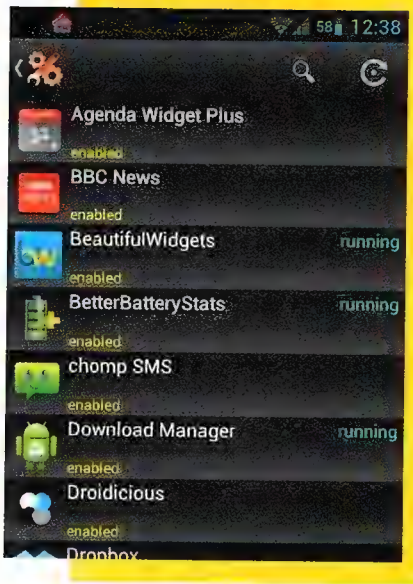
What I do instead is assign any resource-hogging, rarely-used apps a label in Titanium Backup (free or $6.49 for Pro). Labels allow you to perform batch operations on specific apps and better yet, assign these operations to a widget. So, I have a 'Freeze resource hoggers' button on my home screen, next to a 'Defrost resource hoggers' one. This way, the CPU-hungry apps don't exist on my system until I defrost them and then disappear when I'm done with them. Freezing/defrosting them is preferable to uninstalling them, as you keep all your preferences, logins, settings and so on.

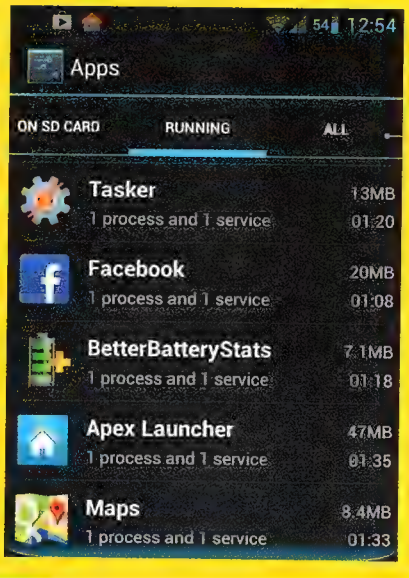
To figure out which apps run at startup, reboot your phone and look at the list in Autorun Manager's 'Basic Mode', noting those apps that you rarely use, but say 'Running' next to them (or be completely thorough and assign labels to all the rarely used apps there). Otherwise, after freshly rebooting your phone, go to 'Settings > Manage Apps' and select the 'Running' tab to see what apps are running at boot.

You can assign labels to these apps in Titanium Backup. Open the app and navigate to the 'Backup/Restore' tab. Touch the app in question, swipe to the right to access the 'Special features' tab and select 'Assign labels'. From here you can create a new label.

To then create the one-touch widgets, long touch on a blank space on your home screen, select 'Widgets' (this may differ depending on your launcher, so the other possibility is that you go to the app drawer and slide over to the 'Widgets' category) and then tap 'Titanium Backup (Actions)'. Then, select 'Action > Freeze all user & system apps (USE FILTERS & EXTREME CAUTION)' and then select 'Filter by > *the filter you created*'. Touching this widget will then disable all those unnecessary apps, while leaving their settings intact.

Next, repeat the whole widget process again, selecting 'Defrost all user & system apps' as the action. Then, when that crisis does eventually come up, just quickly touch the defrost widget and in about 10 seconds all those apps will be back on your phone, just the way you left them.





Autorun Manager's 'Advanced Mode' lists all the apps that are registered for intents.

Assign labels to your rarely used apps using Titanium Backup.

Sync & send SMS from your tablet

You can now send SMSs from your tablet, as if it was your phone. Simon Chester explains how.

U'LL NEED THIS

TABLET TALK

Download the app from Google Play at **tinyurl.com/ajtx4dw** for $1.99.

Tablets are great for reading or watching videos during your daily commute, but it can be a bit of a task when, after receiving an SMS, you to have to juggle your bag, your tablet and your phone, while keeping your balance during the bus driver's less-than-delicate and all-too-regular brake dance (see what I did there?). So, in the interests of both your convenience *and* your safety, you can now keep your phone in your pocket and check, receive and send SMS using your tablet – just as if you were using your phone.

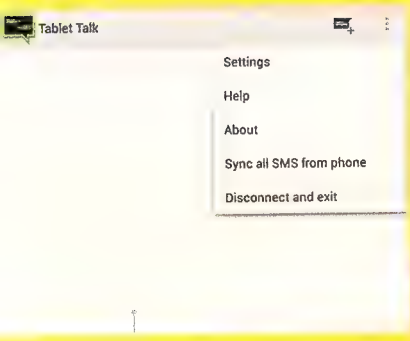
Obviously, there are different ways that this could be achieved, including creating a Bluetooth or Wi-Fi connection between the two devices, or syncing via the cloud. Cloud syncing requires me to trust the service provider and suspicions arise when a free app offers a free syncing service, using servers that they're paying for – I mean, where *is* their revenue coming from? I prefer to keep it local.

I've found that the easiest way to achieve this is to install Tablet Talk ($1.99) from Google Play. Tablet Talk can connect your tablet to your phone via Wi-Fi or Bluetooth. Bluetooth is handy for when you're out and about, as it chews less battery than Wi-Fi, but the Wi-Fi connection is perfect for home, as it works when both of your devices are connected to your network. Alternatively, you can also have it work over Wi-Fi direct if you don't want to deal with Bluetooth.

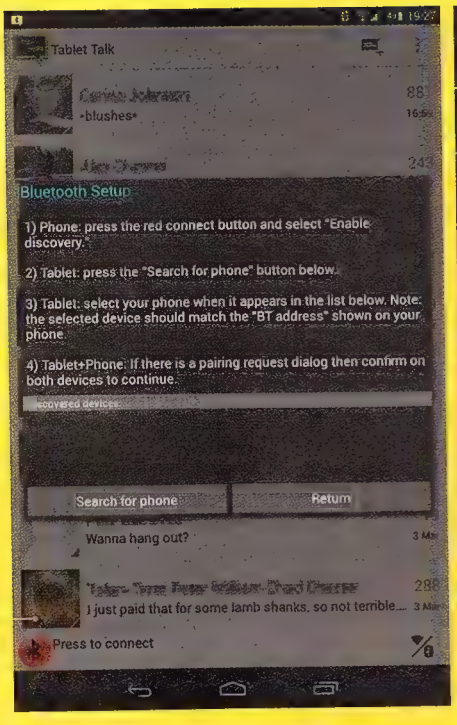
The app is a breeze to set up: simply install it on both devices and select your connection type (Bluetooth or Wi-Fi). If you're connecting over Wi-Fi, the default settings should be fine. With Bluetooth, the first time you connect you'll need to follow the onscreen instructions to pair the two devices. The next time you connect – as long as Bluetooth is enabled on both devices – it will happen automatically. To complete the setup process, on your tablet go to the menu, tap 'Sync all SMS from phone' and in just a few short seconds, you'll have your entire SMS history available on your device.

The next time you're reading on the bus and receive an SMS, a little pop-up will appear on your tablet, from which you can respond. Likewise, to send an SMS from your tablet, just open the Tablet Talk app and send it like you would any other. Since I don't have Tablet Talk enabled all the time, I went into 'Settings > Appearance' and unchecked 'Hide connected icon'. This way, I can quickly access the app to send an SMS and I'm also reminded when I've forgotten to exit the app. However, the latter is pretty much moot, as you can set the app to automatically exit when Wi-Fi or Bluetooth are disconnected ('Settings > Automatic Features'), just as you can set it to automatically start when they connect.

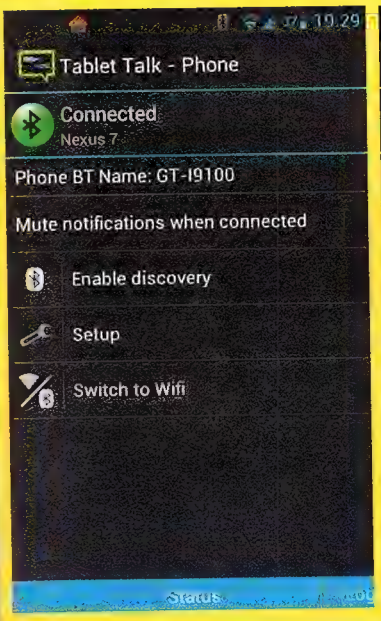
Additionally, you can also have incoming phone call notifications appear on your tablet. If you have a Bluetooth headset connected to your phone, you can answer them or even dial out ('Settings > Caller ID/Phone calls').

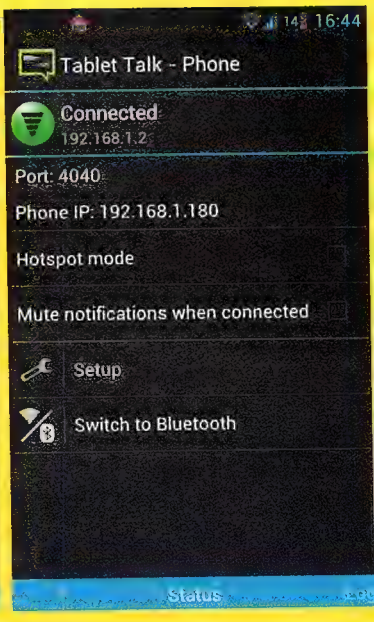


Select 'Sync all SMS from phone' and any SMS received will then appear on your tablet.


Tablet Talk
Bluetooth Setup
1) Phone: press the red connect button and select "Enable discovery".
2) Tablet: press the "Search for phone" button below.
3) Tablet: select your phone when it appears in the list below. Note: the selected device should match the "BT address" shown on your phone.
4) Tablet+Phone: If there is a pairing request dialog then confirm on both devices to continue.
Search for phone
Return
Wanna hang out?
I just paid that for some lamb shanks, so not terrible....
Press to connect

Setting up Tablet Talk via Bluetooth is simply a matter of pairing your phone with your tablet.





Tablet Talk shows you at a glance whether you're connected with Bluetooth (left) or Wi-Fi (right).

Test your network's wiring

Having trouble with your home network? Darren Yates shows you the tools of the trade to test wired network connections.

YOU'LL NEED THIS

A CABLE TESTER

Like anything tech, cable testers are available in a range of prices so be sure to do your research before you make your purchase.

Wireless networking might be the flavour of the month, but the fastest and most secure connections remain wired. Yet when problems occur, where do you start looking, even if we're just talking about your own home network: the router, your modem or the wiring?

Despite the boom in Wi-Fi networking, there's still a growing high-tech trend in home renovations to add network wiring between rooms. If you've seen a couple of episodes of the UK building show *Grand Designs*, you may have seen one or two builds that have hundreds of metres of cables throughout the house and switch connections galore. But you don't even need a home build or renovation as an excuse. I had a single Ethernet connection installed in my home between two bedrooms, complete with wall face plates, simply to get the Ethernet cable off the floor. And of course, we haven't even considered the average business or corporate setup.

You might only have a tiny network setup with a couple of Ethernet connections all with easy access, in which case testing cables might be as simple as ripping one out and replacing it with another. But what if you have hundreds or they're tucked behind panels or walls?

SIMPLE TESTERS

If you take a very simplistic view, a typical well-made Category 5e or 6 network cable consists of four twisted pairs of wire inside a single cable with an eight-pin RJ45 (8P8C) connector on each end. The problem is network cables can vary significantly in quality and there are different faults that sometimes develop within a cable and the connectors.

Plenty of low-cost cable testers exist on the market; for example, look on eBay and you'll find RJ11/RJ45 cable testers starting from just $2.50 including shipping. However, even for basic home use, it's debatable whether they're actually better than nothing at all. The problem is you'll find they retail locally for up to 20 times the price.

Most low-cost testers consist of two parts: the main control unit and a removable remote terminating end that's designed to allow one person to test long cables or those hidden behind walls. Typically powered by a 9V battery, the way they usually work is to just send down DC (direct current) through each wire in turn and see if any of the current ends up where it shouldn't be; for example, if there's a short between two wires or whether there's an open circuit (broken connection).

The bottom line is they're what you'd call continuity testers. At that price, they're certainly cheap and cheerful, but they're little more than 'go/no-go' testers that will more than likely miss more complex problems.

MID-RANGE TESTERS

Spending anywhere up from $50 will gain you a smarter cable tester with added capabilities, and one of those features should be what's called Time Domain Reflectometry (TDR). It's a very clever piece of tech that works by sending short signal pulses through the cable, measuring the time it takes for reflections to return and checking what type of reflections they are.

In a correctly terminated setup, the cable has the same impedance (resistance to AC signals) at both ends and when the signal is transmitted from one end, there's no return as the energy is all absorbed at the other. If the cable has a short or mismatched impedance at the other end, you'll get a pulse reflected back to you because the energy sent – some if it's an impedance mismatch or all if it's a short circuit – comes

CAT 5E VS CAT 6

In most consumer situations, Cat 5e and Cat 6 cables can handle Gigabit Ethernet. However, there are technical differences between the cables in how they're built and also how far you can run them.

Cat 6 cables can deliver Gigabit Ethernet (1000Base-T) for up to 100m, but only 10GBase-T for up to 55m. Why the drop? The higher-frequency bandwidth of faster Ethernet systems makes the setup more susceptible to crosstalk interference and distance makes this worse. Cat 5 cable (including Cat 5e) is designed for up to 100MHz, Cat 6 up to 250MHz and the more recent Cat 6a up to 500MHz. HP has some useful information in a (mostly marketing) white paper at **tinyurl.com/ahbewbc**.

Ethernet cables use what's known as solid-core conductors – the thickness of which somewhat determines the cable quality. Cat 6 cables typically use AWG22 or 24-wire. AWG is the American Wire Gauge system and basically, the smaller the number, the thicker the wire. The reason for using thicker wire is it reduces capacitance and allows for higher-transmission frequencies to support higher data rates. You can find more on the basics of the Cat 6 standard at **tinyurl.com/b6ovssb**.

However, that really only scratches the surface when it comes to cables, as there are plenty of ways to build an Ethernet cable. At the bottom of the gene pool are the very cheap Cat 5e cables that only have two twisted pairs, suitable for 100Base-T (Fast Ethernet) only. You then start working up the food chain, with cable quality improving depending on how you electrically shield it: whether you shield the cable as a whole or the individual wire pairs.

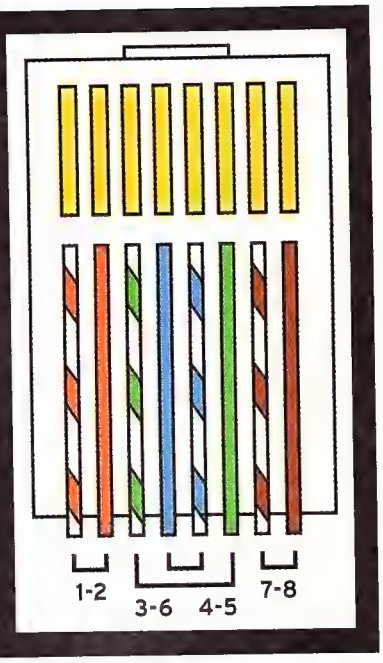
- **U/UTP (unscreened, unshielded twisted pair).** The wires have no shielding of pairs or screening of the cable and relies on the wire twisting and differential pairing to maintain signal quality.
- **U/STP (unscreened, shielded twisted pair).** The individual wire pairs have a braid or foil shielding, while the cable itself has no screening. Better than U/UTP.
- **S/STP (screened, shielded twisted pair).** The best option for high-noise applications, both the cable and the individual wire pairs are shielded and screened to reduce crosstalk and external noise.

LANtest cable tester, available in Australia for $40.

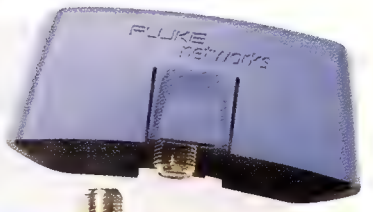
An RJ11/RJ45 cable tester for your keyring. At $2.50, how bad could it be?

WIRING AN ETHERNET CABLE

A standard Ethernet cable consists of four twisted pairs terminated at each end with an RJ45 connector. It's common to think the pairs simply join up to the connector in a simple 1-2, 3-4, 5-6, 7-8 arrangement. However, the industry standard is 1-2, 3-6, 4-5, 7-8. Using the numerical order arrangement will actually generate plenty of crosstalk and show up as a split pair error in any decent meter.



Wiring up an RJ45 straight-through Ethernet cable.



Fluke's MicroScanner2 is a $500 live cable tester with TDR.

back down the cable. However, the return pulse is negative in amplitude.

If you've got a long piece of rope, you can try this out with the kids: tie one end of the rope to a solid fixed point, keep the rope taut, give the other end a real yank and you'll see a wave travel down the rope. As soon as it hits the other end, the wave will reflect back to you, but in the opposite vertical plane. It's this sort of principle that TDR works by.

Electrons that carry the signal travel through a cable at speeds approaching the speed of light. But in these days of microprocessors, the speed of light isn't as quick as you'd think. In fact, this is where something called the Wave Propagation Speed (WPS, also known as Propagation Velocity) comes in: the speed at which a wave travels through a wire connection. And it differs depending on the internal makeup of the insulating material of the cable. It's measured as a proportion of the speed of light – Teflon has a WPS of 0.695, polyethylene 0.67 and expanded Teflon 0.81.

In practice, it takes about 5 nanoseconds (ns) for a wave to travel 1m in standard Ethernet cable (known as 'propagation delay'), which is generally accepted to have a WPS of around 0.66. But it's slow enough to measure and that's what TDR does. Even in relatively low-cost options, TDR can be used to measure the distance to a fault in a cable, or even the length of a cable, to a passable degree of accuracy.

However, moderately priced TDR-capable cable testers usually have to be dynamically calibrated to have any hope of being accurate, typically by the user with a known length of known-type cable and the meter's calibration process. The longer the cable, the more accurate the result will be. Higher-end brand-name models shouldn't need this user calibration, but in the end, you can pinpoint the distance of the problem, allowing you to decide whether to replace the cable or cut and reterminate it.

The one major problem with cheaper sub-$100 models is they can't be used in live applications – you can only use them on cables or unpowered patch panels, so they're no good for commercial premises yet suitable for light-duty residential settings. Better mid-range models such as Fluke's MicroScanner2 not

Simple testers like this $30 model perform tests on USB, BNC and RJ45 cables.

only handle live or active situations, they can also check for services such as POTS (telephone) and PoE (power over Ethernet). The MicroScanner2 also has a wiremap adapter built into its cap, with all the necessary adapters for RJ45, RJ11 (phone) and coax on board. Look online and you'll pay at least $500 for one of these.

COMMERCIAL TESTERS

Length testing is more a simple on/off use of TDR, but an important one used in industry for testing long, underground cables. More serious testers again go a step further by allowing you to accurately measure dB signal loss (also known as attenuation or insertion loss) in-circuit and show signs of deterioration in cables and connectors. Over time, cables and in particular, connectors, do age and their ability to carry high-frequency signals can deteriorate – something a basic continuity-based wiremapping test won't be able to detect. This level of TDR testing allows you to find this deterioration before it becomes a serious issue.

Other testers can be used to determine a cable's fitness for use. Something like a Fluke CableIQ will set you back around $1,600, although it's able to qualify cabling to meet various 10/100/1000 Ethernet standards. If you're going to be guaranteeing cable data specs in a professional capacity, you'd need something like a professional qualification tester.

Commercial testers can also find tougher-to-diagnose problems such as identifying crosstalk (data interference between two wires), even down to the location. In fact, measuring crosstalk between wires is a typical way for checking for split pairs – an error usually resulting from incorrectly wired cables.

These sorts of testers have become the chief diagnostic tool among network technicians whose job it is to maintain equipment or locate the source of faults. Many professional testers now feature automated testing that can store tests from multiple locations, although they're well beyond what you'd need in the average home.

GET TESTING!

If you rarely move or even adjust your Ethernet cables, they're kept at standard room temperature and they're high-quality cables, it's unlikely you should see problems develop. However, if you're forever moving things around, have cables tucked behind walls where temperatures can well exceed room temperature or even just make your own cables, a good cable tester isn't a bad bit of gear to have on deck. It can quickly pick up a host of problems and alternatively, rule out your cables as a source of other network issues.

Fluke's LinkRunner AT 1000, a live network tester for cable and fibre optics.

This combined cable tester and digital multimeter is available for under $100.

Fluke's CableIQ meter has TDR and can qualify cables for Ethernet standards.

Using a cable tester

Darren Yates shows you how to use a low-cost sub-$100 cable tester with TDR on your network wiring.

There are a number of moderate-cost cable testers on the market. We picked up a commonly sold SC8108 on eBay for $35 including shipping. It looks a bit like the old Fluke 620 and it features TDR and comes with a remote wiremap adapter to allow both local and remote cable installation testing. It's powered by four AA batteries (they can be rechargeable NiMH – we've used Eneloops with success) and runs on roughly 16mA, so they should last a good 100 hours between charges. You'll find it sold under a number of brands with the 8108 model number.

BASIC CABLE TESTING

To do a basic patch cable test, you don't need the remote wiremap terminator – just plug the two cable ends into the RJ45 connectors on the back of the SC8108. The two ports are labelled 'Main' (M) and 'Loopback' (L).

Turn on the unit, select the 'Wiremap' menu option with the 'PAIR&L' button and within a few seconds, you'll get a basic visual wiremap of the cable, giving you a quick 'pass' or 'fail' indicator, as well as which wires are connected and those that aren't. The codes in the wiremap will also give you a quick indication as to where the cable fault lies: within 10% of either end or somewhere in the middle.

REMOTE TESTING A WALL CABLE

This is where the wiremap remote unit comes into play. You typically need two short lengths of known-good cable to patch between the two wall connections and your tester: one patch to the wiremap remote unit and the other to the main tester. When you run through the basic wiremap test, you'll now get an ID number shown on the display. The remote unit also has an internal piezo buzzer that will sound off when you're testing it if you have an offsider to provide a physical check.

While most TDR-capable testers only come with one remote unit, you can purchase the meter with extras – they're exactly the same except that they have different ID numbers. So, if you have multiple patch panels to check, you can set up multiple wiremap remote units and test them in one hit. It allows you to check multiple ports on your router or patch panel in one test session, without having to go back to the other end and reposition your one remote wiremap unit or having a second person on hand. You'll find the SC8108 with a full eight set of far-end test jacks for under $100.

FIND THE LENGTH OF A CABLE

The action of measuring cable length with this meter, as well as individual pairs and where a pair fault is located, is pretty simple. Turn on the meter, select the 'Pair&Length' menu option with the up and down arrow buttons and press the 'PAIR&L' button. However, if you want accurate results, there's a bit more you'll need to do.

CALIBRATING FOR LENGTH MEASUREMENTS

As you'll read in the 'Cat 5e vs Cat 6' box on page 80, cables differ in their construction and propagation delay, which can affect the accuracy of TDR readings. It's therefore recommended before you attempt a length measurement that you calibrate the meter first with a minimum 5m length of cable that matches the type you wish to test. You then run through the dynamic calibration test, adjust the setting to match your cable length and the meter should then accurately read for that particular cable type to within 3%.

The SC8108 isn't a bad little unit, provided you keep your expectations modest. It won't be as accurate as a Fluke CableIQ by any stretch, but it'd be a passable first port of call tester in a small business and certainly for home use.

The SC8108, a budget TDR tester available on eBay for under $50.

TESTER SAFETY

Most consumer-grade meters can't be used in live situations, otherwise you can damage the tester's circuitry. You therefore need to make sure you're just testing individual cable segments.

Drunk on gaming

Resident oenophile Graham Morrison reveals the dark art of running Wine on Linux.

YOU'LL NEED THIS

UBUNTU

We're going to use Ubuntu Linux 12.04 LTS as the foundation for our games system. This means you'll need to have it installed, updated and connected.

HARDWARE

While games performance on Linux is comparable to native versions, you'll still need a decent machine plus graphics card to play most of them. Nvidia cards tend to work better on Linux.

GAMES

You'll also need the games you want to play. They're installed just as they would be on a real Windows machine, so you'll need the DVDs. Steam can also work.

For many years, Linux was in the gaming wilderness. The last major studio release was *DOOM 3*, although a variety of third-party developers have worked hard to port other titles to the system – most notably, Linux Game Publishing. There's been plenty of independent development, but the lack of any major ports has meant that if you want to play the latest titles, you needed a better solution.

Over the years, several companies have tried to find a better solution, but the most successful (and the only company still relevant) is called CodeWeavers, with its CrossOver product. CrossOver's purpose in life is to play devil's advocate, allowing Windows applications and games within Linux and OS X. You might think it does this by incorporating Microsoft's libraries into the Linux ecosystem somehow, but it doesn't. You don't need a Windows licence to run CrossOver, but it does rely on many different downloads and packages to pull all this functionality together. The clever part is that CrossOver handles all this for you. If you want to install the Steam client, for example, you need only select the application from a GUI and CrossOver will handle the rest.

TRY CROSSOVER

The easiest way to see what CrossOver is capable of is to try it. Although it's a commercial product, it costs about the same as a single premium game and has a two-week trial with no obligation. You can even check for game compatibility against CrossOver's online database. If you want to give the trial a go, make sure you download the Debian/Ubuntu package. This will grab a DEB file, which is the package format used by the Ubuntu distribution. As with Windows, a 64-bit operating system can run both 32- and 64-bit packages (and games), but you can't run 64-bit stuff from a 32-bit installation. With the package downloaded, simply double-click on it to run the package manager. This is important because Ubuntu will want to install other packages that CrossOver depends upon.

After installation, you should find a CrossOver menu or item within Ubuntu's desktop menu. Click on the 'Install software' button to see the games and applications list we mentioned earlier. This is the complete list of titles supported by CrossOver. Scroll through to find Steam, for example, which you can then install by selecting it and clicking on the 'Install' button. As you can see from the description, CrossOver will want to install the original versions of Microsoft's XML parser, Flash, DirectX Runtime and Microsoft's core fonts to be able to run the client, so installation will depend on your download speed. When it has completed, the Steam icon will be added to your launch menu. It will also be available within CrossOver's main application interface and from there you'll be able to install further Steam titles. Only titles with official CrossOver support will work, but there are still plenty to choose from.

A FREER ALTERNATIVE

CrossOver is built on an open-source technology lovingly referred to as Wine. In classic Linux parlance, this is a recursive acronym where the letters represent 'Wine Is Not an Emulator'. The developers of Wine got fed up always explaining why their project wasn't actually an emulator, but a 'compatibility layer' between Linux and Windows. However, to most of us, it does the same job as an emulator and that's the best way of describing it. The difference between Wine and a traditional emulator is that it doesn't run the CPU code. A Gameboy emulator models the instruction set of a Z80 processor, for instance, and the MAME arcade emulator models everything in software from the CPUs to the audio and graphical units. This slows them down and only makes the emulation of older systems technically viable, but Wine skips this part. Instead, it translates Windows API calls into their Linux equivalent, and where there is no Linux equivalent – such as with Direct3D's pixel shaders – the developers have written the code themselves. This is why you can run Windows applications and games without a Windows licence, and the result is that when you can get a game working with Wine, you can expect close to native performance from your Linux machine.

Wine is open source and any Linux user can download, install and run it and its associated applications freely. The relationship with the CrossOver project is also a symbiotic one – any compatibility enhancements made to CrossOver are automatically rolled into the Wine project, albeit with a slight delay. If you want to play the latest games, you'll have

GOOD OLD GAMES

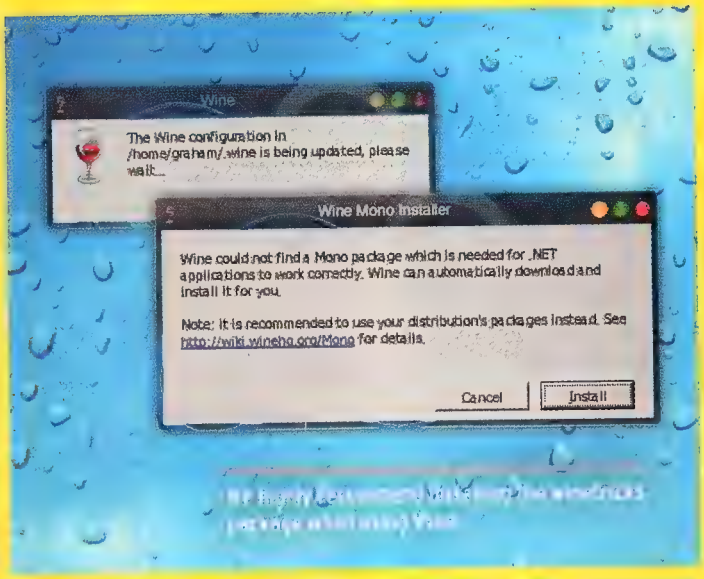
It was last October when the classic games portal Good Old Games deflated Linux users with the news that it wouldn't be supporting Linux officially – at least not until it had re-evaluated the platform. The reason it gave was that Linux is just too diverse to be able to provide its awesome point-and-click service, and this is true to an extent. However, many of the older games offered by the site use open-source tools to run the software and those tools are readily available from the Ubuntu package manager. The two most popular are the LucasArts interpreter and DOSBox. DOSBox will run old PC-compatible DOS titles and it's much easier to use than in the bad old days when you had to juggle weird memory managers to make the most of that 640KB base memory. After it's installed, open up the command line and place your old DOS game into a folder. Type `dosbox` to launch DOSBox. To run the game, first type `MOUNT C.` to mount the folder you launched DOSBox from as the C: drive, followed by `dir` and the name of the executable you want to run.

HOW DOES WINE WORK?

Wine is a very clever piece of work, which is why it's been ported to other Unix-like systems such as BSD and Apple's OS X. The company behind CrossOver is even developing a version for Android, which must surely force the team to accept that Wine really is an emulator, as much of Android is ARM-based and Wine will need some sort of x86 implementation to work.

But even without the CPU, Wine is horrendously complex. 3D graphics, for instance, are unlocked from their Windows-bound interface and translated into the equivalent for Linux. Often, the 3D instructions themselves don't change – this is handled by OpenGL – but the way these instructions are encapsulated need to be converted in real time. DirectDraw routines are also extrapolated into their storage structures, so these can be used effectively within Linux.

All of this work isn't just to let you play games – Microsoft Office is also a big target for Wine, as are Adobe's various creative tools. They can all be made to work on your Linux desktop, to a varying degree. Sometimes you have to accept that the original Excel is going to do a better job with your VBScripts than the latest LibreOffice, but as with most things in Linux, it's all about offering the choice.

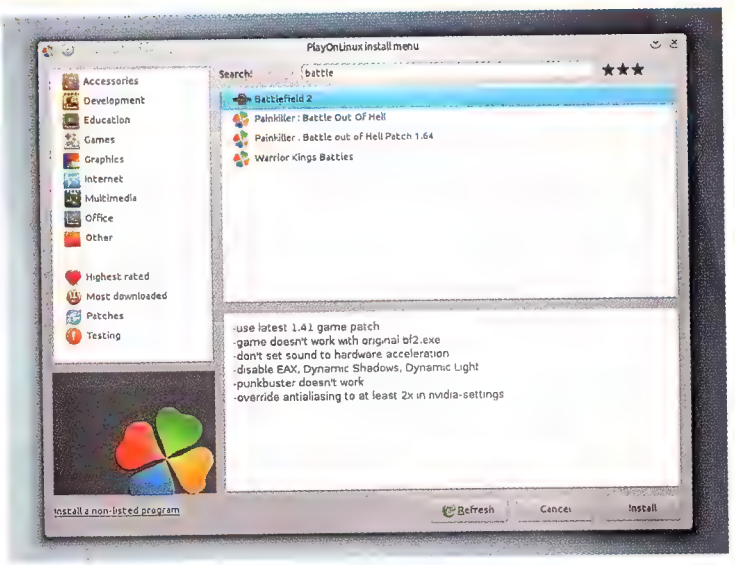

Wine
The Wine configuration in /home/graham/.wine is being updated, please wait...
Wine Mono Installer
Wine could not find a Mono package which is needed for .NET applications to work correctly. Wine can automatically download and install it for you.
Note: it is recommended to use your distribution's packages instead. See http://wiki.winehq.org/Mono for details.
Cancel
Install

to either install the development version of Wine or pay for CrossOver.

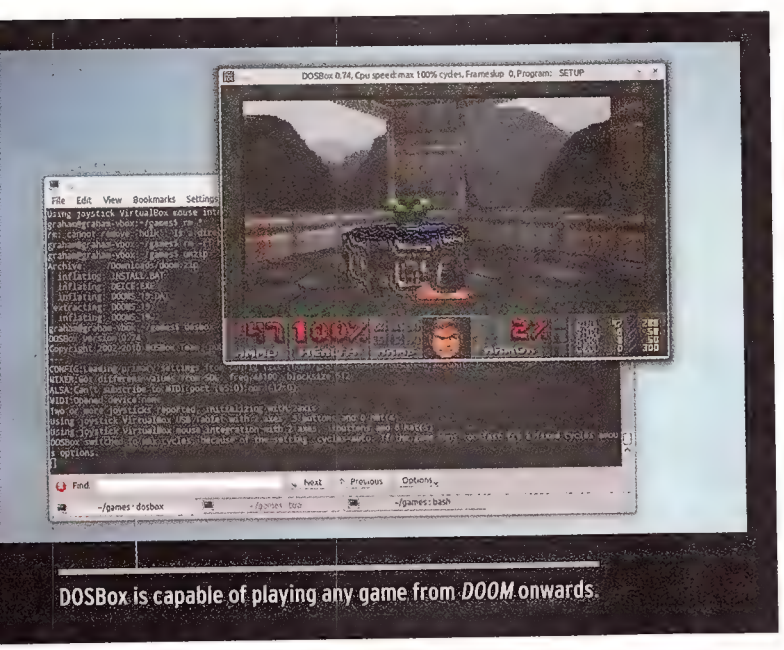
Like CrossOver, Wine uses a precious metal scale for judging compatibility, so you can check the Wine web site to see whether there's good enough support for your favourite games before you install the software. The top 10 list of platinum titles – those judged to 'install and run flawlessly on an out-of-the-box Wine installation' – include *World of Warcraft* 4.3.x, *StarCraft II*, *The Elder Scrolls IV: Oblivion* 1.2.x and *BioShock* 1.0. The gold list is for titles that 'work flawlessly with some special configuration' and these include the Steam client, *Warhammer Online*, *Fallout 3* and *Team Fortress 2* from Steam. Even silver titles should work with only minor issues and even if your game isn't mentioned, you're encouraged to give it a try and report your results.

PLAYONLINUX

'Giving it a try' is where Wine differs most from CrossOver because it lacks the profile management and the one-click install interface of its commercial cousin. At its core, Wine is an executable, a pile of Perl scripts, a mass of libraries and some configuration files. Fortunately, there's another brilliant solution if you want to run Wine without the



PlayOnLinux is a one-click solution for installing Steam and many other titles with a Wine configuration.



DOSBox is capable of playing any game from *DOOM* onwards.

Wine doesn't sidestep any security systems, so you'll still need game keys and discs.

JARGON BUSTER

COMMAND LINE

This is what scares most non-Linux users the most, but it's actually very easy to use. Just think of it as an old school text adventure: type in a command and see the results. As with DOS, it's often the quickest and easiest way of getting things sorted out.

PACKAGE MANAGEMENT

Most Linux applications can't simply be downloaded as an executable and installed – they need to be installed through a package manager. A package manager is akin to an app store because it allows you to install and update stuff (including dependencies) automatically. Dependencies are things an application needs to run.

Older games like *Half-Life 2* perform brilliantly in Wine, including many of the titles available on Steam.

configuration hassle and that's something called PlayOnLinux. PlayOnLinux is a graphical front end to Wine and it can be installed easily through the Ubuntu Software Center. You'll find that a lot of other packages are installed at the same time, including Wine, so this is a failsafe method for getting a working configuration. It also keeps you away from the command line because PlayOnLinux can be launched from Ubuntu's 'Applications' menu, and you can install game profiles from the web site.

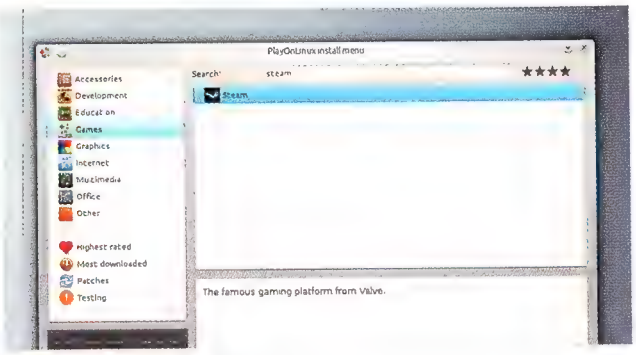
The first time you run it, you'll need to skip through a short wizard, which will first create a virtual drive to store your Wine configuration, and potentially download more fonts. Virtual drives are used so that each title is self-contained. This means you can configure Windows any way you want and it won't affect other titles using different virtual drives. The disadvantage is that the application will create a new virtual drive for every new title unless you say otherwise. This will use up more storage and download many of the same packages with each game installation, so be warned.

After this initial download has completed, the main application window will become accessible and you can use the 'Install' button to add your own games and get them running on Wine. The 'Install window updates' option presents a list of all known compatible titles. It doesn't make any attempt to list them according to the quality of their recreations on Wine, so you'll still need to check the Wine web site again to check compatibility. Clicking on a title gives you some background information on which updates might be required plus the in-game configuration that's known to work best. If your title is installed from a disc, you'll be asked where the disc can be found on the Linux file system. Modern Linux systems such as Ubuntu use a dynamic mounting system, but PlayOnLinux should detect this and list the optical drive by its volume name. Just select this and let the installer get on with its job.

The problems targeted by CrossOver, Wine and PlayOnLinux are never going to be solved because they're chasing a moving target. For that reason alone, you should also consider keeping these packages up to date on your Linux system. Not only will this mean new games will be added, but as the quality of Wine's 'not-emulation' improves, so will your stability and frame rates. While some people may leave their Linux installation without ever running an update, if you're into gaming you need to stay ahead. That means both updating the packages when you can and jumping to a new version of the distribution when one becomes available. Ubuntu will let you upgrade from an old version, but make sure you at least back up your home folder before you attempt this. It's another reason why CrossOver and PlayOnLinux are your best options, because both will automatically update the Wine engine they use for running software, giving you the best possible opportunity for making the most of your Linux system and never returning to the Microsoft licence treadmill again.

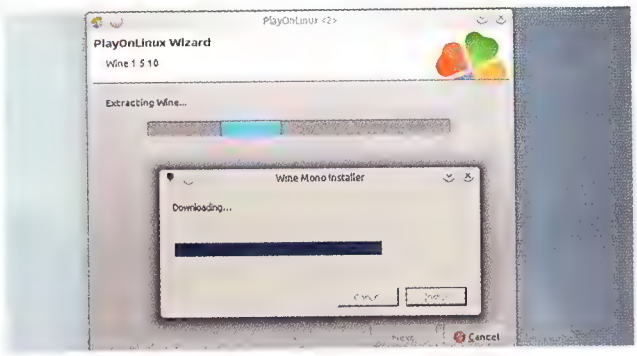
PLAY NATIVE WINDOWS GAMES FROM STEAM

Steam-power your Linux machine and play new and classic Windows games.



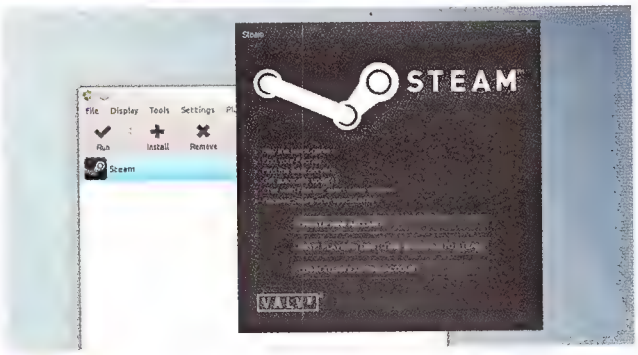
01 ADD SOME STEAM

After installing PlayOnLinux, run the application from the launch menu and skip through the first-time wizard if it appears. To add a title, click on the large 'Install' icon and either scroll through the list of titles or use the search field to filter the results. Clicking on a title will give you a little background info about the game. Click 'Install' to start the process.



02 GET INSTALLING

The installation process will depend on the title you're installing. With the Steam client, you'll need to wait while plenty of packages are downloaded and installed. On our vanilla installation, for example, PlayOnLinux installed Mono (an open-source version of Microsoft .Net), Gecko for HTML and finally Steam. You're also asked how much memory your graphics card has.

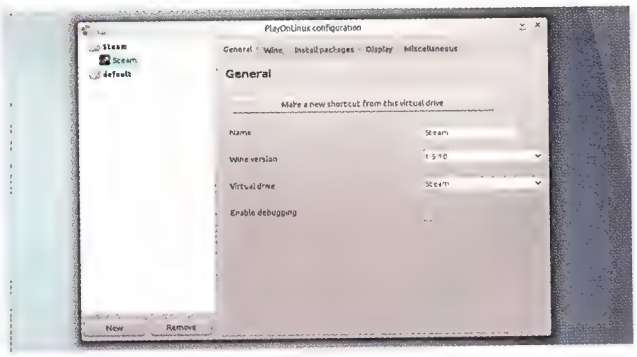


03 STEAM WITHIN WINE

After the install, you should find the Steam icon on the PlayOnLinux main window. Double-clicking this will run Steam within Wine, and as with the native client on Windows, the first launch invariably updates the Steam client itself. Wine should manage this transparently before presenting you with the account accreditation window. Now it's time to get browsing!

04 BROWSE THE STORE

Every time you run the Steam client, it will take you directly to the 'Store' and 'Library' overview. You can then download and attempt to run a game. Remember that Steam thinks you're running the Windows client, so accept the default install location, even though C:// makes no sense. Also, while Steam will happily install anything you ask it to, each title has its own compatibility requirements, so take care.



05 WINE TASTING

If you run into problems, access the 'Configure' window for the title in question. This opens a Pandora's box full of the options Wine uses to perform its magic. You can change the renderer to 'OpenGL' in the 'Display' panel, for example, or use specific versions of Wine for specific titles.

06 CONFIGURE THIS

For in-depth configuration without having to resort to using the command line, open the 'Wine' page of the configuration window. From here, you can edit the virtual Windows registry and reboot the machine. The Wine window lets you select a different audio output, which is a useful option for USB headphones.

Improve your system's reliability

Jon Thompson explains how Windows Reliability Monitor can save your PC.

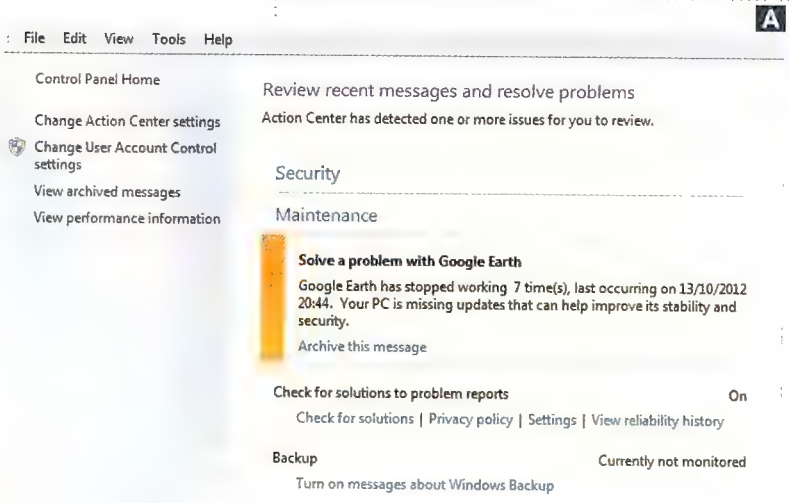
YOU'LL NEED THIS

WINDOWS VISTA OR LATER

No additional software is needed for this how-to – the Windows Reliability Reporter is built into all versions of Windows, starting with Vista.

Modern Windows is fast and reliable, but it's not perfect. Programs and services can still silently crash in the background and bring the whole thing to a halt, losing work and data. The problem is, if we don't know about these internal problems, we'll always be at their mercy.

In Windows Vista and later, however, there's built-in help in the form of the Windows Reliability Monitor. This little-known utility has saved us more than once from an unstable system, and it can do the same for you by pinpointing exactly what's gone wrong. It also gives you peace of mind that malware isn't the cause of your issues.

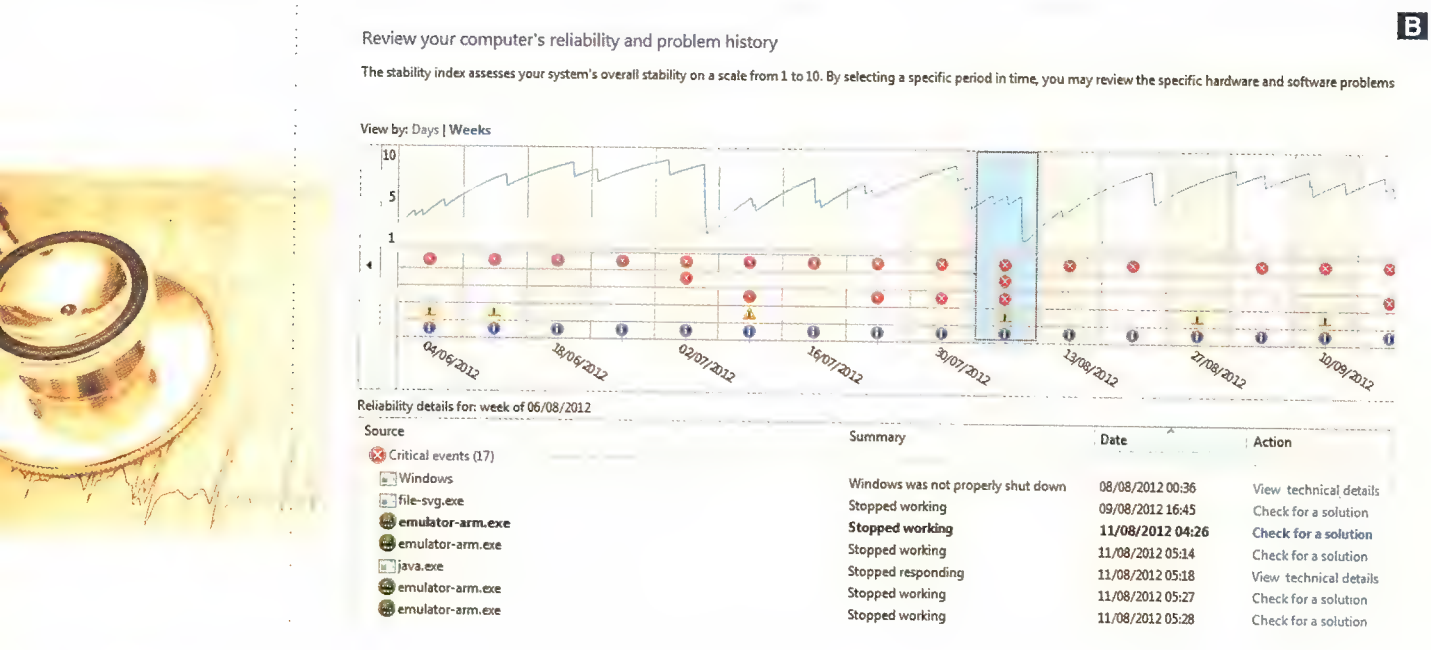

A
File Edit View Tools Help
Control Panel Home
Change Action Center settings
Change User Account Control settings
View archived messages
View performance information
Review recent messages and resolve problems
Action Center has detected one or more issues for you to review.
Security
Maintenance
Solve a problem with Google Earth
Google Earth has stopped working 7 time(s), last occurring on 13/10/2012 20:44. Your PC is missing updates that can help improve its stability and security.
Archive this message
Check for solutions to problem reports
On
Check for solutions | Privacy policy | Settings | View reliability history
Backup
Currently not monitored
Turn on messages about Windows Backup

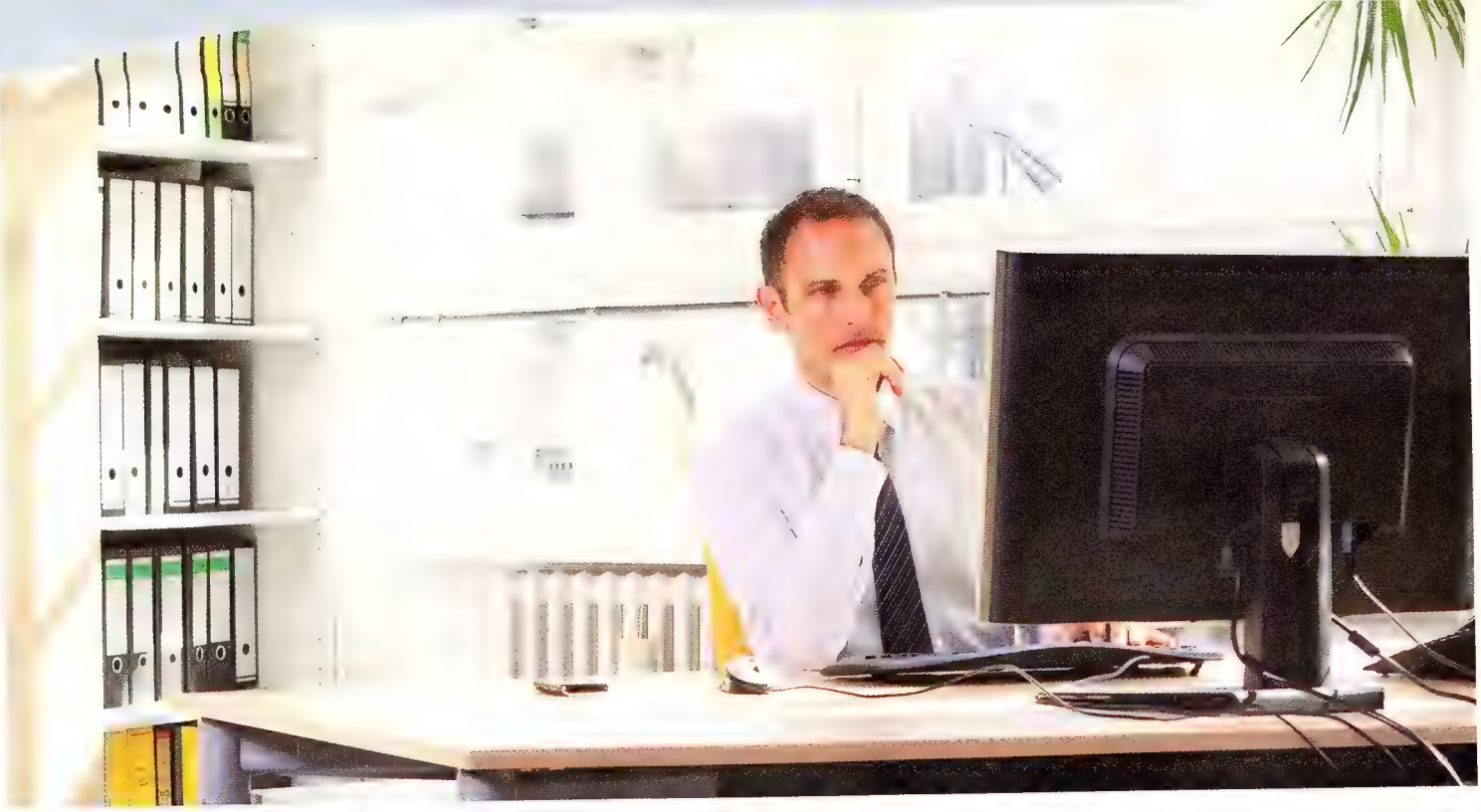
01 Open Windows 7 Performance Monitor

The Windows 7 Performance Monitor is buried within the depths of the 'Control Panel'. To open it, first open the 'Control Panel' from the 'Start' button. Once it's running, click the 'System and Security' section. Within that, click the 'Action Center' and then expand the 'Maintenance' section that appears. Here you'll find the option to view your PC's reliability.

A Click 'View reliability history'. This creates a report using the reliability data Windows 7 has stored. The report takes a minute or so to compile and display. Toward the top you'll see a graph that gives a simple indication of your computer's overall reliability. Under that is a chart of the different kinds of problems that are keeping your PC from scoring a perfect 10.

B To get a fuller overview of system reliability, click the 'Weeks' option at the top of the screen. You can scroll back and forth over the weeks with the left and right arrow keys. To drill down into the data, press Enter and a list of the system problems for the day or week will appear in the lower pane.





02 Investigate performance issues

Critical events are ones that cause internal failures or complete operating system crashes. They're listed in the top three 'Failure' lines of the data table under the graph. Click the weeks when these occurred to learn more. Double-click an entry to see the technical details.

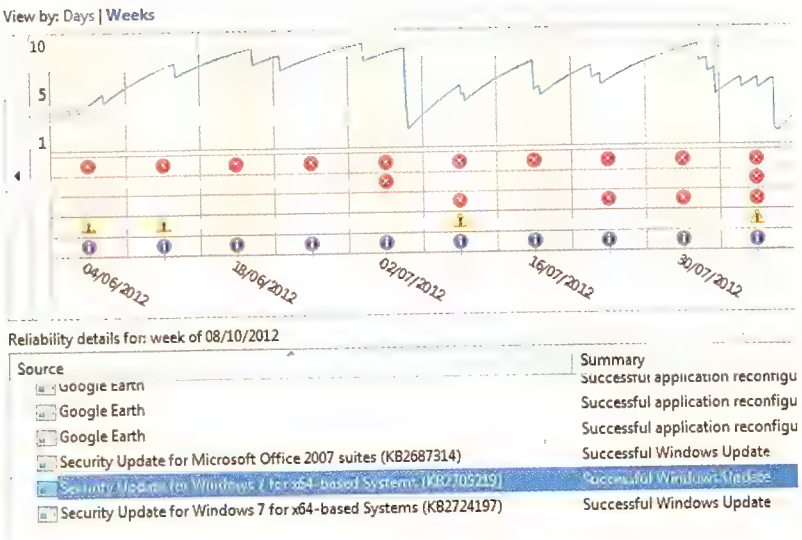
Windows can help solve issues by accessing its online database of previous problems. To seek out a possible answer, click 'Check for a solution' in the 'Action' column of the relevant entry in the lower pane. There's no guarantee that Windows can put things right itself, but it's worth a try.

C In order to keep your computer safe and secure, it's essential that your installation of Windows is updated with the latest patches. This should happen without any input from you, but if the automatic update process fails, you usually don't find out about it. Click the weeks that are highlighted with a yellow warning triangle and then look in the lower pane. Are there any 'Failed Windows Update' entries? If so, make a note reminding yourself to update Windows manually later. It will take too long to do right now.

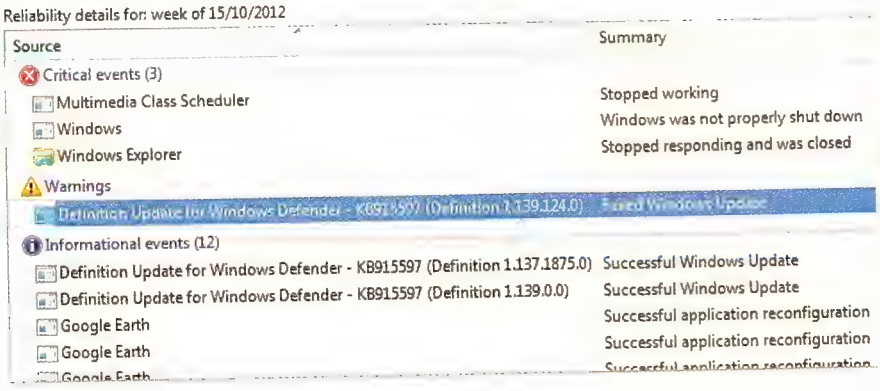
It's highly likely that as you step back through the reliability history you'll find certain drivers that keep crashing. Sometimes these crashes can cause system instability. This can also happen with browser plug-ins – Adobe Flash Player is a particular favourite. If you haven't updated such software recently, add it to your list of potential updates for later.

D Select an entry where there are blue 'i' symbols in the data. As well as failures and warnings, Windows Reliability Monitor tells you about things that have gone well. You can see how the system and applications have been updated automatically. In many cases, these updates happen silently, so this is the only notification you have that they succeeded.

D



C



03 View all problem reports

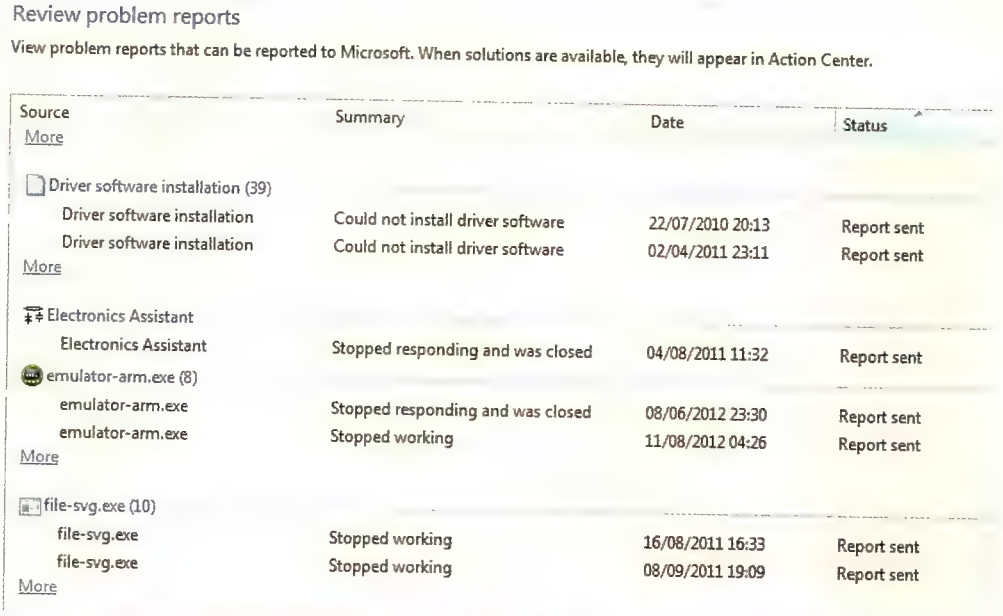
E At the bottom of the screen, you'll find the option to view all problem reports. This produces a long list of all the problems the operating system and installed software have encountered. You can sort this list by clicking a column title. You might find that an anonymous report has been sent to Microsoft to help the programmers concerned with system stability.

In the list of problem reports, you'll see solutions listed for certain applications and drivers. Find one and right-click it, then select 'View solution'. Windows Reliability Monitor will access what's known about the problem. It might provide instructions for you to follow, or it might give you a link that will let you download a more recent version of the application.

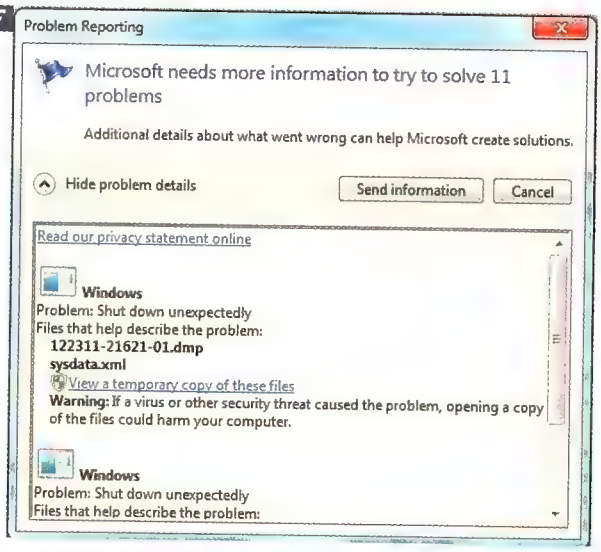
F If you just want to see if there are any available solutions to the collection of problems your computer has encountered to date, go to the main Reliability Monitor screen and click 'Check for solutions to all problems'. Windows may need to send anonymous information to Microsoft to get solutions. If this is the case, click 'Send information' to receive any available answers.

G When a program fails, Windows will automatically start looking for a solution, but this isn't always appropriate. Click the 'Back' button in Reliability Monitor and open the 'Maintenance' section. Click 'Settings' to set the default behaviour when a program crashes. It's best to check for solutions as you go, but you can have Windows ask you what to do when something crashes.

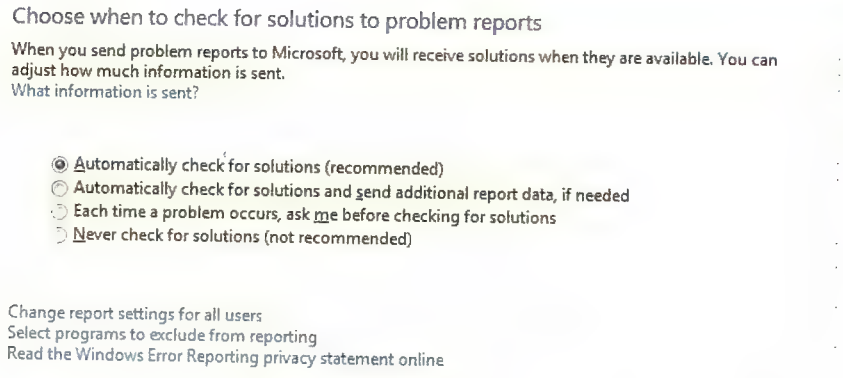
E



F


Problem Reporting
Microsoft needs more information to try to solve 11 problems
Additional details about what went wrong can help Microsoft create solutions.
Hide problem details
Send information
Cancel
Read our privacy statement online
Windows
Problem: Shut down unexpectedly
Files that help describe the problem:
122311-21621-01.dmp
sysdata.xml
View a temporary copy of these files
Warning: If a virus or other security threat caused the problem, opening a copy of the files could harm your computer.
Windows
Problem: Shut down unexpectedly
Files that help describe the problem:

G


Choose when to check for solutions to problem reports
When you send problem reports to Microsoft, you will receive solutions when they are available. You can adjust how much information is sent.
What information is sent?
Automatically check for solutions (recommended)
Automatically check for solutions and send additional report data, if needed
Each time a problem occurs, ask me before checking for solutions
Never check for solutions (not recommended)
Change report settings for all users
Select programs to exclude from reporting
Read the Windows Error Reporting privacy statement online

04 Update Windows manually

Finally, if you need to update Windows, it's time to do so. Click the 'Back' button at the top-left of the screen, then 'Windows Update' at the bottom-left and 'Install Updates'. You may have to reboot when this is complete. Check with Reliability Monitor regularly to see if there have been any failures, particularly with Windows updates, to keep your PC healthy.

MALWARE & VIRUSES

The Windows Reliability Monitor is a great tool for revealing instability patterns, which may indicate that your computer is infected with malware or a virus. An infection may not cause your computer to crash, but it may affect a service running in the background, causing it to crash every few days. With the Reliability Monitor, you'll be able to spot those patterns and shut down malicious software before it can do any damage.

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- 1 x USB ports for 3/4G mobile WAN, FTP and printer server.
- 32 x VPN tunnels with hardware accelerator, comprehensive protocols for easy interoffice communication.
- Object based SPI firewall with Dos/DDoS defence, Web Content Filter, Content Security Management, etc. for maximum network security.
- TR-069 remote access, QoS and management tools for simplifying administrators' tasks.

	Vigor2830	Vigor2830n	Vigor2830n+	Vigor2830Vn	Vigor2830Vn+
Wireless AP		◉	◉	◉	◉
Dual-Band Wireless			◉		◉
VoIP				◉	◉

Vigor2760 series - SOHO Class Firewall Router
VDSL2/ADSL2+, 3/4G mobile, Gigabit Switch, 2 VPN tunnels

TAIWAN EXCELLENCE 2012

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- 4 x Gigabit LAN ports for high speed network connectivity.
- 30k NAT sessions and IPv6 for next generation broadband readiness.
- 2 x USB ports for 3/4G mobile WAN, FTP and printer server.
- 2 x VPN tunnels with hardware accelerator, comprehensive protocols for easy home/office communication.
- Object based SPI firewall with Dos/DDoS defence, Web Content Filter, Content Security Management, etc. for maximum network security.
- QoS (Layer 2&3, 802.1P, TOS/DCSP) for prioritizing video, voice, online game and data traffic.
- TR-069 remote access and management tools for simplifying administrators' tasks.

	Vigor2760	Vigor2760n
Wireless AP		◉

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HTML 5

PART 9

Complex web animations

In this month's instalment of our HTML5 masterclass, John Allsopp explains how to create more complex animations for the web using CSS3.

APC EXPERT

JOHN ALLSOPP

With a background in computer science and mathematics – and a great deal of good fortune – John Allsopp's life collided with the web in the early '90s. For nearly 20 years he has developed software for web developers, built web sites and apps, and written books, countless articles and tutorials for print and online publications. In 2000, he wrote *A Dao of Web Design*, which over a decade later continues to be widely cited as the theoretical foundation for Responsive Web Design.

Last month we looked at how we can very easily animate the change in an element's properties, such as its colour or transparency, using CSS3 transitions. While transitions simply animate a start and end point, this time we look at how we can create multi-step animations using CSS animations.

WHAT'S THE DIFFERENCE?

The CSS transitions we saw last month simply animate the change in CSS properties, triggered by events like a user hovering their mouse over an element. CSS animations allow us to define multi-step animations that can play once, a certain number of times or indefinitely.

Animation doesn't have to be entertainment or just eye candy. We can use CSS animations to create very practical user interactions.

HOW DO THEY WORK?

Creating an animation is a two-step process. We need to create an animation using the `@keyframes` feature, which is new to CSS3, as well as associate this animation with one or more elements and tailor the animation for that element.

If you're going to play along, I'd suggest using Internet Explorer 10 or Firefox to preview your work, as these support CSS animations without vendor prefixes.

KEYFRAMES

As we mentioned above, we create an animation using a new CSS3 rule type: `@keyframes`. This specifies (at a minimum) a starting and ending set of properties, as well as optional steps in the animation. Let's imagine we want an element to start in the top-left corner of the page, move to the bottom in the middle and then move up to the top right-hand corner.

Here's how we might do this:

```
@keyframes opening-sequence {

  0% {
        left: 0;
        top: 0;
  }

  50% {
        left: 42.5%;
        top: 95%
  }

  100% {
        left: 75%;
        top: 0
  }
}
```

Notice how the `@keyframes` rule has a name (here it's `opening-sequence`). We have three sections of the form:

```
X% {
        /* set of properties to animate */
}
```

We must have at least two such sections: one for 0% (the `%` is required, unlike units for `0` most of the time in CSS) and one for 100%. Here we also have one for 50%, though we could have several, even hundreds of such steps.

Now we have our animation, but what is it going to actually *animate*? Well, we can use it to animate virtually any element (or every element) on the page; a single animation can be used by multiple elements, even simultaneously.

So how do we associate an animation with an element? That's where the name of the animation comes in. In CSS3, there are several new properties associated with animations. The first we'll need is `animation-name`. Here we'll use it to associate our animation with the first `h1` element in the document.

```
body > h1:first-of-type {
        position: absolute;
        width: 25%;
        left: 0;
```

FURTHER READING ON ANIMATIONS

- AnimatR (**tinyurl.com/b9lagco**), my tool for exploring with CSS3 animations.
- The example throbbing button from this article **tinyurl.com/bajsq54**.
- An in-depth article on CSS transitions and animations I wrote a couple of years back: **tinyurl.com/ad85nez**.
- CSS3 animations (along with HTML5 audio) used to create the opening titles for a conference at **vimeo.com/25355309**.
- A grab bag of animation examples from around the web can be found at **tinyurl.com/38tz724**.

```
        top: 0;
        animation-name: opening-sequence
}
```

The most important part here is the property `animation-name`, which we give the value `opening-sequence` (the name we gave our animation in the `@keyframes` rule). Basically, we're saying that any element selected by this rule (that is, the first `h1` element in the page) should use the animation with the name `opening-sequence`. That's all we need. However, we'll likely want to tailor it a little more. We do this using a number of other new CSS properties that we add to our rule.

- We can use `animation-duration` to specify how long an animation should take to complete. As with transitions, we can use seconds (unit `s`) or milliseconds (unit `ms`) to specify the length of an animation.
- Using `animation-delay`, we can specify a time (again in `s` or `ms`) to elapse *before* an animation starts.
- The code `animation-iteration-count` specifies how many times an animation should run. It can be either a number or the keyword `infinite` if we want it to run indefinitely.
- As with transitions, we can choose different timing functions for how the browser decides the intermediate states of the animation between keyframes using `animation-timing-function`. Take a look at last month's article for more on these possible values, including `ease`, `linear`, `ease-in` and `ease-out`.
- Using the `animation-direction` property, we can specify whether after animating to the end values, the animation immediately reverts to the initial values or animates back to the initial values. With `animation-direction: normal`, only the change from initial to final values is animated; if it's `alternate`, then the change back to the initial values is also animated.

So let's return to our animation and tweak it a little.

```
body > h1:first-of-type {
        animation-name: opening-sequence;
        animation-duration: 5s;
        animation-iteration-count: infinite;
        animation-timing-function: ease;
        animation-direction: normal;
}
```

This gives us an `h1` element, which infinitely moves from the top left-hand corner of the page, to the bottom middle, then up to the top right-hand corner, then back down to the bottom middle, and finally to the top left-hand corner, before doing it all over again.

ANIMATIONS IN THE REAL WORLD

We've covered the fundamentals of the technology, so how might we use them in the real world? Suppose we've got a button we want to call attention to, such as 'Sign up' or 'Register now'. We could create a nice-looking button like this at right:

A pure CSS3 button, based on a design by Hello Happy **hellohappy.org/css3-buttons**.

With a little animation, we can draw attention to it even more. Here we'll use `box-shadow` to add a 'glow' around the button and then we'll animate it.

```
@-webkit-keyframes throb {

  0% {
        box-shadow: inset 0px 0px
0px 1px rgba(255, 115, 100, 0.4), 0 1px 3px #333333; 0 0 3px
rgba(255, 0, 0, .2);
  }

  100% {
        box-shadow: inset 0px 0px 0px 1px rgba(255, 115, 100, 0.4),
0 1px 3px #333333, 0 0 12px rgba(255, 0, 0, .8);
  }
}
```

We give our button this animated effect using the animation properties we just saw:

```
button {
        animation-name: throb;
        animation-duration: 1s;
        animation-iteration-count: infinite;
        animation-timing-function: ease-in;
        animation-direction: alternate;
}
```

Now our button is animated between these two states.

If you want to actually see it in action, including all the code you'll need to make it happen, take a look at **tinyurl.com/bajsq54**.

COMPATIBILITY

As we've seen throughout this series, when using new features of CSS3, we need to be concerned with what happens in browsers that don't support a feature. We can use CSS animations in a way that's completely in harmony with older browsers, such as with our button here, or in a way that's hostile to the user of non-supporting browsers.

If we're using animations to add a little more to an existing interface or design (as we've seen with shadows, gradients and other features of CSS), then users of non-supporting browsers aren't adversely impacted. Imagine we created a game that relied on animation being supported; users with non-supporting browsers wouldn't be able to play at all.

As with all the newer features of HTML5 and CSS3, it's important to consider what experience users of non-supporting browsers will have.

VENDOR PREFIXES

As we've seen in earlier instalments, these are required when a browser experimentally supports a feature of (typically) CSS. With animations, if you've taken a quick peek at the button in action, you'll have noticed we only need the standard syntax, plus `-webkit-` for Chrome and Safari. Note that we also need a rather odd-looking prefix for `@keyframes`; namely, `@-webkit-keyframes`.

TOOLS TO HELP YOU ANIMATE

If you're a little daunted by the syntax, I developed a web-based animation tool called AnimatR. You can use it to explore and create CSS3 animations – it even creates all the code for you, and provides helpful compatibility info as well. You can find AnimatR at **tinyurl.com/b9lagco**.

COMING UP

We've spent quite a bit of time on animation, but that's laid the foundation for working with what we'll be covering next time, CSS transforms, to create really eye-catching interactions, including card flip-style effects you see in iOS app, and more.

PROJECT 6

Web-controlled music player

Create a network-connected stereo audio player that you control via a web browser. Darren Yates shows you how with an Arduino microcontroller.

APC EXPERT

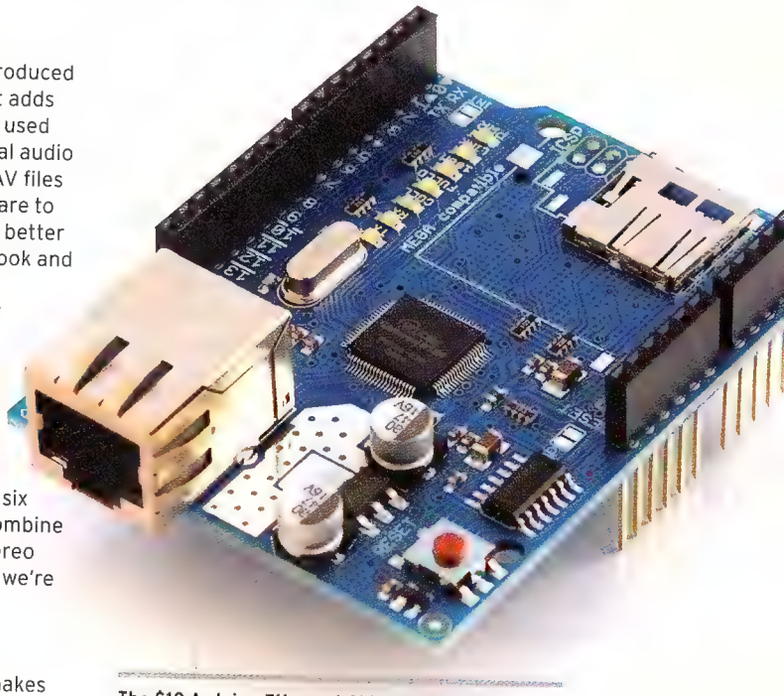
DARREN YATES

Darren is a multi-award-winning journalist who started building and testing computers in the early '90s. He's developed a range of PC software, including *PC User*'s UserBench benchmark series starting in 2005, its UserOS Linux distros in 2008 and is now working on new benchmarks for Android when he's not busy writing or torturing hardware with his soldering iron.

In our Arduino masterclass last month, we briefly introduced the Ethernet Shield, an Arduino expansion board that adds Ethernet connectivity plus microSD card storage. We used that storage as the basis of a simple one-button digital audio player. It was functional, but limited to 8-bit mono WAV files with a 19kHz sample rate. We also gave you the software to create those specific files. The audio quality was a bit better than AM radio level, which is good enough for audiobook and basic music playback.

Four weeks on and we're continually astounded by this little Arduino Uno board and just what software developers are able to scrape out of its 16MHz/8-bit ATMEG328P microcontroller.

Thanks to recent online work by Lutz Lisseck, it's now technically possible to push this little chip to pump out 16-bit stereo audio with a 31.25kHz sample rate – that's basically FM radio – with little more than six resistors and a couple of capacitors. We're going to combine the Ethernet Shield with Lisseck's work to create a stereo 8-bit audio player that comes with its own web server we're calling NetPlay.



The $10 Arduino Ethernet Shield provides microSD storage, Ethernet and built-in TCP/IP stack.

GETTING AROUND LIMITATIONS

The 'SimpleSDAudio' library (**tinyurl.com/bhdq3ot**) makes it possible to push the boundaries of the Arduino Uno and create a standalone project that leaves us gobsmacked.

Unfortunately, it's not possible to combine the Ethernet Shield's Ethernet function with 16-bit stereo audio – basically, there just aren't enough pulse-width modulated (PWM) outputs to go around. However, we're taking one of Lisseck's 'SimpleSDAudio' examples and creating a stereo 8-bit audio player with 15kHz bandwidth that you can control via a web browser on your PC, tablet or smartphone.

The $10 Ethernet Shield you can grab from eBay contains a Wiznet W5100 Ethernet controller chip that comes with its own TCP/IP stack. Combined with its microSD card slot, which supports up to 32GB of storage, and it's a seriously impressive little add-on board. It's enough to create your own little web server that can dish up web pages to a browser on your PC, laptop, tablet or smartphone. More importantly, it's a web server you can use to control the outputs of the Arduino Uno and get it to do some seriously cool stuff.

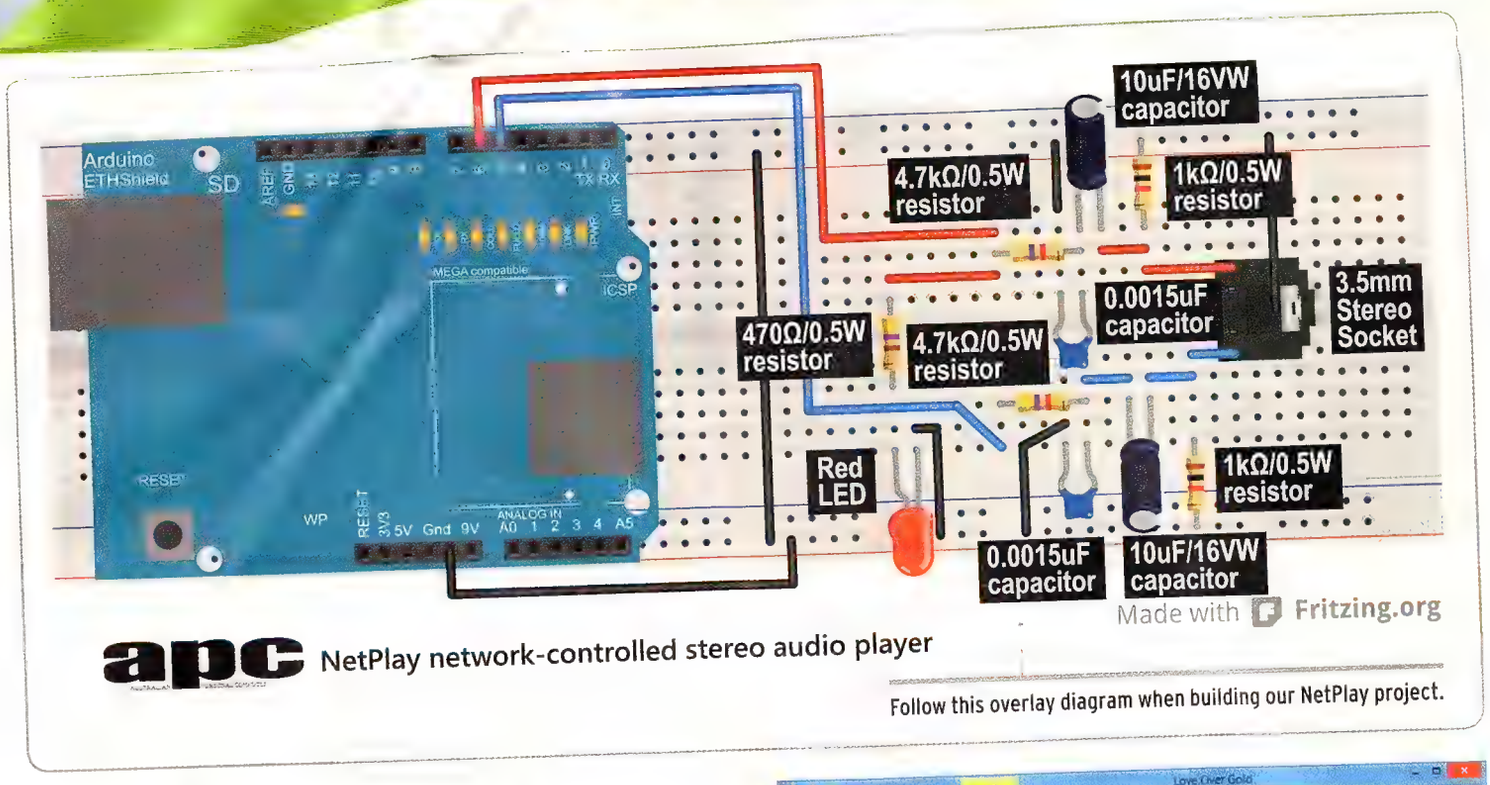
WEBLED

To give you a taste, we'll start this month with a simple example: turning an LED on and off over your home network. Using the Ethernet library bundled with the Arduino 1.0.3 IDE, it's reasonably simple to create a web server that waits for incoming traffic and spits out HTML code back to the client. Using an HTML form, our little WebLED sketch accepts data back from the client to control the digital output D5 to switch an LED on and off.

Sure, it's pretty simple, but use your imagination and some extra electronics, and that LED could be a motor, an emergency beacon, a video recorder, model railway, coffee machine or a water pump. You've also got up to 21 digital outputs you can individually control via the web, exponentially expanding the possibilities.

The circuit is about as simple as you can get: a 470ohm current-limiting resistor and an LED. Go through the 'APC_06_WebLED.ino' sketch (grab it from **apcmag.com/arduino.htm**) to see how it works. You need little more than half a dozen lines of code to create a web server. In fact, most of the code (and there's not much of it there) is setting up the web page and parsing the response from the client.

This will give you a taste not only for the possibilities, but also for how our NetPlay stereo audio player works.



apc NetPlay network-controlled stereo audio player

Follow this overlay diagram when building our NetPlay project.

Building NetPlay

Building our NetPlay project isn't much more complicated than building the WebLED. In fact, it's pretty similar to last month's audio player.

Again, we're using the Arduino's PWM outputs to turn digitally sampled audio back into an analogue voltage approximation. These outputs appear at the D5 and D6 pins on the Ethernet shield. (The Shield doesn't do anything at this point – these outputs are feed-throughs from the Arduino board underneath.)

These are fed through a resistor divider network, which doubles as a basic first-order low-pass filter to knock off some of the PWM clock signal to just leave the audio signal we want. If you built last month's project, you can use the same 3.5mm stereo socket, so there's no more soldering required.

Once you've programmed the NetPlay sketch into the Arduino, you can power the project by using a USB charger straight into the USB port of the Arduino board. Plug an Ethernet cable into the Ethernet Shield and the other end into a spare port on your ADSL modem/router. Plug the Ethernet cable in first and then apply the power, as the project will be up and running within a second or two of that power being applied.

CREATING NETPLAY AUDIO TRACKS

While NetPlay can't handle standard 44.1kHz/16-bit stereo WAV files (well, not yet at any rate), we've made decent progress in the four weeks from last month's audio project, jumping from 19kHz sample rate/8-bit mono PCM audio playback to 31.25kHz/8-bit stereo PCM.

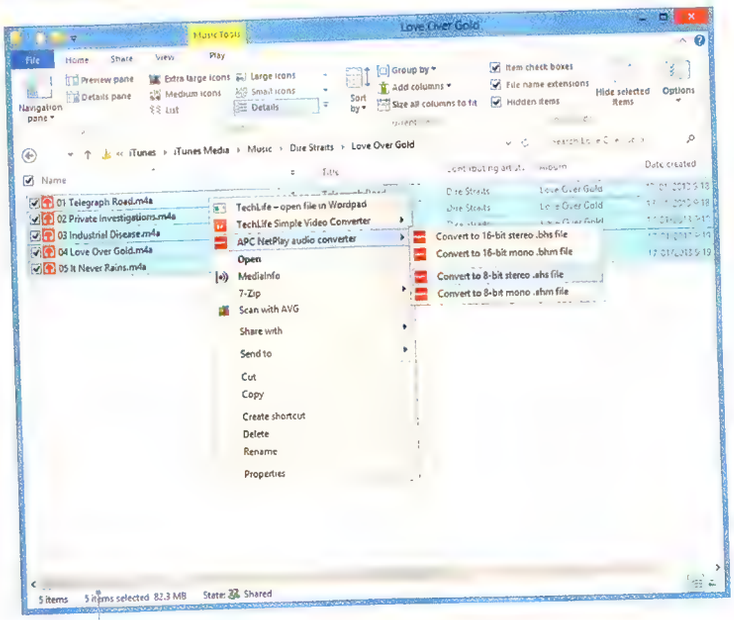
Thanks to Nyquist's Theorem, a 31.25kHz sample rate gives us a practical audio bandwidth of around 15kHz, which as we said before is FM radio territory and much better than the 9kHz bandwidth we were talking about last month.

However, we still need to create these files, so we've modified the Auduino Windows audio converter app from last month to create a NetPlay version – it's a Windows registry key file that integrates the encoding commands straight into Windows Explorer's right-click context menu. When activated, it converts any audio file into NetPlay stereo format using a combination of FFmpeg and SoX open-source audio converters.

Like last month, we also need to keep the files in an 8.3 DOS file naming format and our NetPlay audio converter does this automatically.

INSTALL THE CONVERTER

To install the NetPlay audio converter, simply launch the 'installnetplay.reg' registry key file. It adds a key for the menu text you'll see on the right-click menu, as well as the commands we want those menu options to carry out. The 'uninstallnetplay.reg' file removes those registry keys and the menu entries.



Launch the 'installnetplay.reg' registry key file to install the audio converter.

First, grab the 'netplay.zip' file from **dl.techlife.net/apps/netplay.zip**. Unzip it to your C: drive, where it will automatically create the C:\netplay folder and dump the contents there.

We use a combination of FFmpeg to convert audio files into a standard 44.1kHz/16-bit stereo WAV format and feed that into SoX to create our 31.25kHz/8-bit stereo raw PCM files. FFmpeg can also create these files, but unfortunately, it has fixed steps in its audio bandwidth settings that are locked, irrespective of the sample rate you choose. For example, create a 19kHz audio file with FFmpeg and the audio bandwidth is no better than 7.5kHz – the same bandwidth you get when creating a 16kHz file. Do it with SoX and a 19kHz sampled file gets a bandwidth closer to 9kHz, which sounds much better. The same thing happens creating a 31.25kHz sample rate audio file – you get 10kHz bandwidth with FFmpeg, but 15kHz with SoX.

How NetPlay works

The key to NetPlay is Lutz Lisseck's 'SimpleSDAudio' library. What makes this library impressive is that it greatly increases the sample rate/audio bandwidth possible from an Arduino Uno board. The key to that is the speed of data processing and it's only made possible by using large dollops of Assembler programming rather than the standard Arduino C++ derivative programming. It's also impressive because it uses what little RAM the Arduino Uno's ATMEGA328P has (just 2KB) and manages to create a loopback buffer that continually reads the audio file data from the microSD card slot into two 512-byte segments – while the data is being played from one, it's being loaded up into the other.

LIMITATIONS

In order to get the comparatively high sample rates we're using, the microSD card slot on the Ethernet Shield has to run at half SPI speed at least. The diode-based level translation circuit we used last month with that cheap $2 SD card reader won't work (at least not reliably). You'd need to add a CMOS 74HC4050 level translator chip and do the translation properly. Thankfully, the Ethernet Shield has this covered, so you can use any microSD card and it should work perfectly well.

The other limitation is a little more serious and prevents us from playing back 16-bit stereo audio. The Ethernet port and the microSD card reader both operate using the SPI bus, so only one device can be accessed at a time. Given the way our NetPlay audio player works, that's not too much of a problem. More importantly, the Ethernet port uses pins D10 through D13.

Lisseck realised that by using two PWM outputs and combining them with a simple 256R-R resistor ladder, you could approximate 16-bit audio output. The problem is the 'SimpleSDAudio' library requires the two primary PWM outputs to be D9 and D10, with the secondary two as D5 and D6. With D10 being locked up by the Ethernet port, it means not only can the Ethernet Shield not deliver 16-bit stereo, you can't even get 8-bit stereo.

THE FIX

While there's no way at present around the problem of D10 being locked up, it is possible to re-route the primary PWM outputs to D5 and D6 so that we can at least get 8-bit stereo. We've applied these modifications to the 'SimpleSDAudio' library we've included in our sketch package so we can at least get 8-bit stereo happening. Unfortunately, the library doesn't yet support 16-bit mono, which would've been nice...

However, there's one extra task you must do that we can't. In our 'netplayarduino.zip' file (available at **apcmag.com/arduino.htm**), you'll find a 'wiring.c' file. This has to replace the one inside the Arduino 1.0.3 IDE, which you'll find under \hardware\arduino\cores\arduino. Rename the original file as 'wiring_orig.c' and then copy the new version across.

In short, this enables the swapping of these PWM outputs (D9/D10 to D5/D6) as well as changing the function of the interrupt timer that some of the back-end functions use. Note that in order for other Arduino project sketches to work correctly, you'll need to swap the original 'wiring.c' file back in when you're done with this one.

ETHERNET/SD CARD CODE

Lisseck has also added in a basic FAT32 file system reader for the microSD card to the 'SimpleSDAudio' library, which makes it pretty trivial to read the contents of the card and play audio files from it.

By bringing in the Ethernet library as well, you can use the 'SimpleSDAudio' library to automatically read the filenames from the card and output them as part of HTML code. The Ethernet library turns the Arduino Uno into a basic web server you can access via any PC, laptop, tablet or smartphone on your home network.

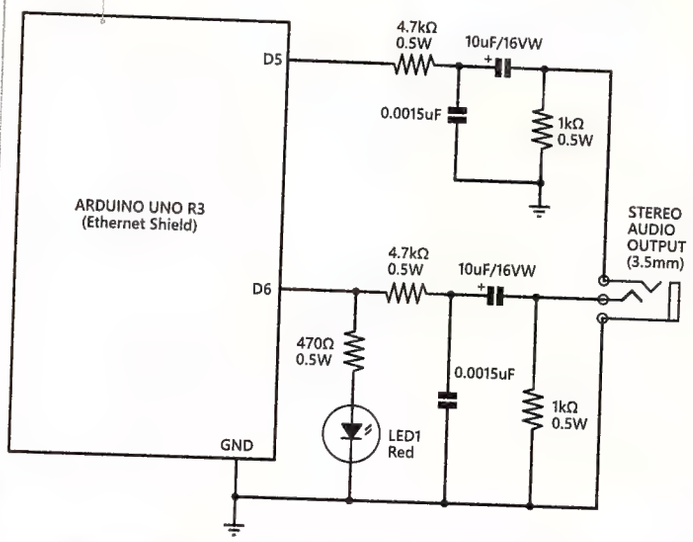
Making things simple, Lisseck provides an example sketch for doing exactly this in his library. However, because of the D10 issue, he's limited the example to 8-bit mono audiofiles only through the D9 output. We've modified the library and the example to handle 8-bit stereo through outputs D5 and D6 instead (you must still make the 'wiring.c' file substitution in the Arduino IDE folder) and improved the web server code so you can choose different songs and stop playback at any time, rather than having to use the browser's 'Back' button all the time.

The 'SimpleSDAudio' library is so CPU efficient that we're not even using half the capacity of the ATMEGA328P processor. As it's capable of playing 16-bit stereo at the same 31.25kHz sample rate, there's room left over to add your own extra functionality (within reason) and still get stereo audio happening.

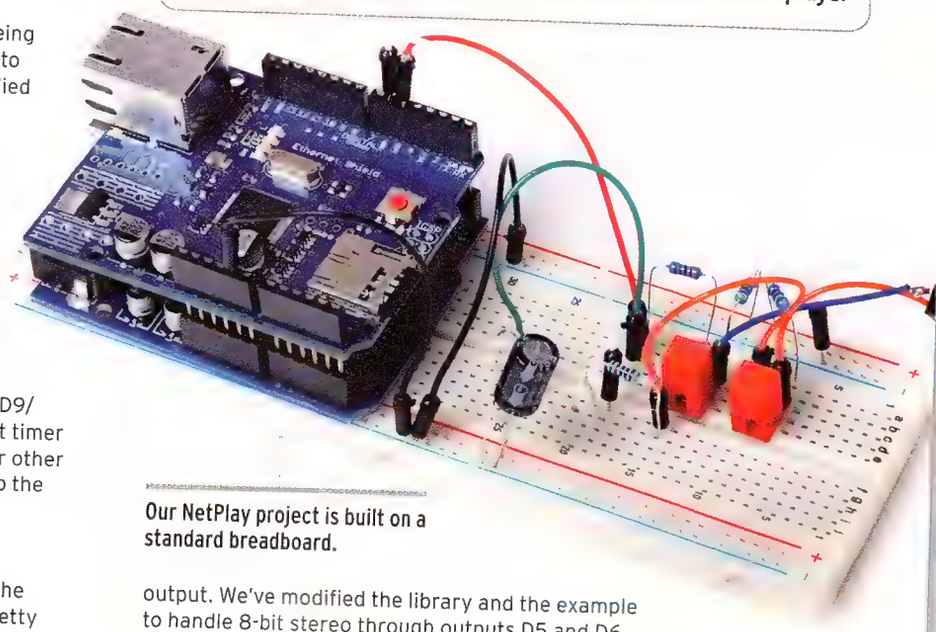
8-BIT AUDIO

Much of today's music is so dynamically compressed that you don't need the dynamic range afforded by having 16 bits of sample depth. Basic 8-bit audio gives you 48dB of dynamic range, which is often more than enough for R&B, rock and hip hop. For classical music, it's woefully inadequate because you'll clearly hear the background noise during quieter passages – a reason why 16-bit/96dB dynamic range audio came alive with the first audio CDs.

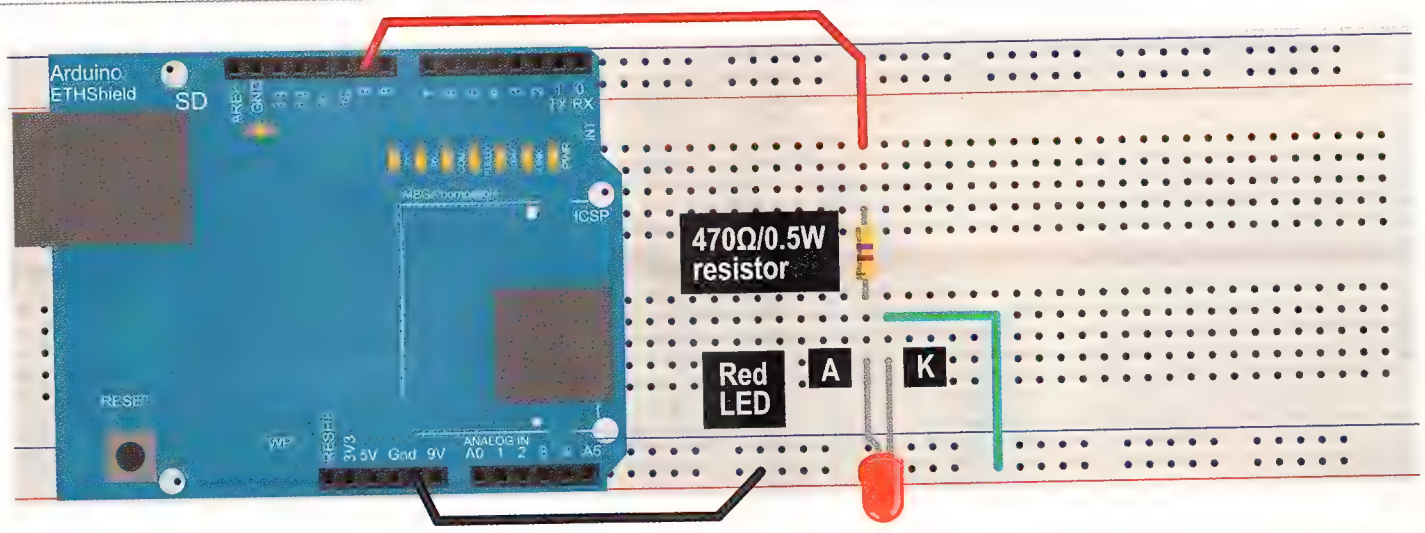
The circuit for our NetPlay audio player.



apc NetPlay network-controlled stereo audio player



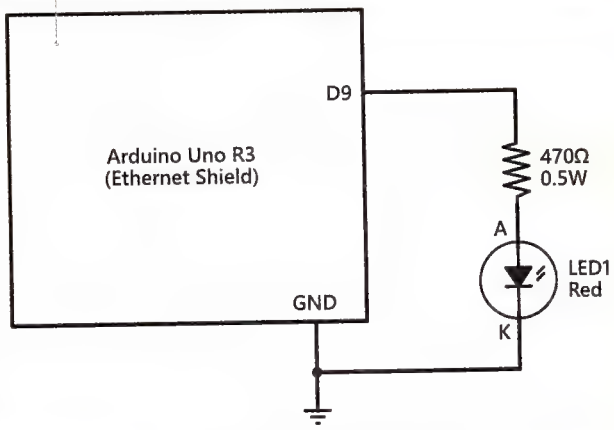
Our NetPlay project is built on a standard breadboard.



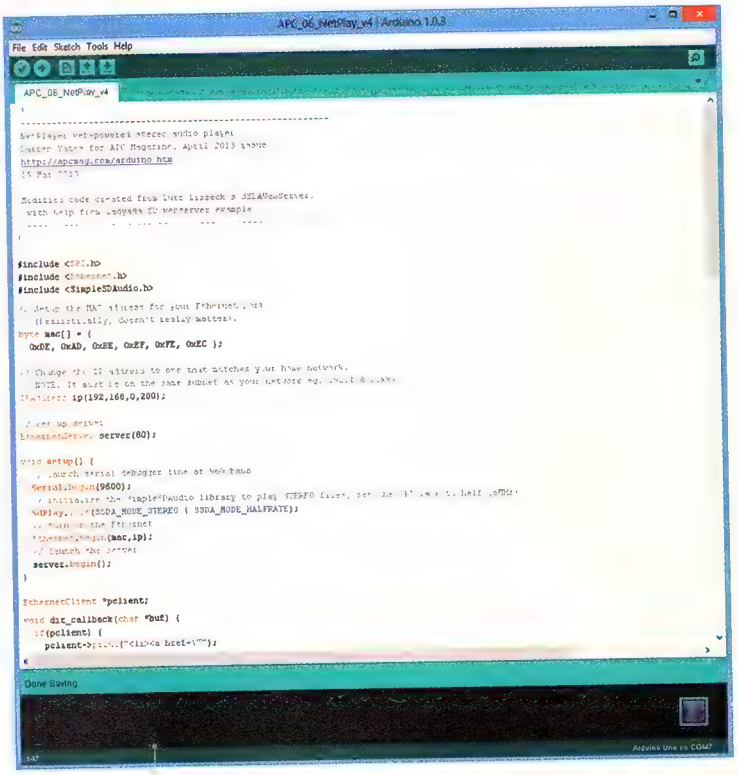
WebLED network-controlled LED

We've modified Lisseck's example with a 'play and stay' web interface and stop link.

It doesn't get much simpler than this for a network-controlled circuit.



WebLED network-controlled LED



The Arduino sketch for NetPlay is available at **apcmag.com/arduino.htm.**

HOW YOU USE IT

First, build the project following the circuit and overlay diagrams. Next, grab the 'netplayarduino.zip' file, unzip it to your C: drive and copy the 'SimpleSDAudio' library to your Arduino IDE's \libraries folder. Next, back up the original 'wiring.c' file we mentioned before and copy in the new one from the ZIP folder.

Fire up the Arduino IDE and load in the 'apc_06_netplay_v4.ino' sketch file. The most important thing here is to change NetPlay's IP address to one that suits your home network. It'll need to match the first three 8-bit numbers of your network; for example, if you live on a 192.168.0.xxx subnet, pick a spare address from that same subnet. Change the sketch, save it and program the Arduino Uno board.

After that, using NetPlay is pretty easy: create a bunch of audio files using our NetPlay audio converter and copy them to a microSD card slot. Load them into the Ethernet Shield and start it up. On your client, enter the Arduino's IP address into your browser and you'll see a list of filename hyperlinks. Click on one and that file will begin playing through NetPlay and your powered speaker system. Click on another at any time and the new track will start. Click the 'Stop Playback' link to stop.

In the end, the Arduino Uno controller does double-shift as an audio player and web server in one.

GIVE IT A TRY

Granted, there's not much in the way of hardware, but this is still a pretty complex example of what the Arduino Uno is capable of. The fact that it can do all this with just a handful of components makes it even more impressive. While we all love our GHz-powered computers and tablets, hopefully this is a good reminder that not every application needs more than 16MHz of CPU clock speed and a huge operating system to run it. When you build for a specific application, you might be surprised at just how little processing power you actually need to interact with the real world. APC

100 games

HIGH-PERFORMANCE ME

REAL RACING 3

There's a fine line between pleasure and pay.

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IOS • ANDROID

The *Real Racing* franchise is one you've no doubt come across over the years, but may not have delved into, largely due to its stiff price point. I hesitate at anything over a buck these days, but now could be the time to dig in, with the third game adopting the freemium pay scheme. The game is free to play, although progress is cripplingly slow unless you buy services via in-app purchases. It's a tough balance between giving players just enough while enticing them with the fast route carrot, but Firemonkeys didn't quite get the balance right and instead comes across as a little grabby. Thankfully, the racing itself is wonderful, looks amazing on the Retina iPad and features enough tweakable back-end options to challenge both beginner and experienced racers alike – at least until the bank account runs dry.

TC

Crysis 3

Pulse-pounding and fun, but more evolution than revolution.

PC

@ www.crysis.com $ PC $78, consoles $98

Crysis 3's campaign feels more of a continuation than a reinvention of *Crysis 2*. Paramilitary bad guy corporation CELL has taken credit for your heroic effort in the last game and while you've been asleep, it's been busy exploiting some secret power source to revitalise ruined NYC. Enormous barriers called Nanodomes have been erected to accelerate eco growth and serve as the main setting. At the start of the story you're sprung from a stasis pod by Psycho – a former fellow Raptor Team member – to join a rebellion against CELL. Psycho and other soldiers have been 'skinned' of their Nanosuits, making you, Prophet, the only one on the planet. Cue the standard "you're humanity's saviour!" spiel. And while your unique bond with Ceph DNA grants you new powers, it also potentially exposes you to being controlled by the Ceph hivemind.

Psycho's vendetta to find out who separated him from his superskin motivates the first few hours. The campaign also sprinkles in optional secondary objectives; some are as simple as clearing a set of mines around a light armoured vehicle using the Nanosuit's new hacking mechanic. Completing these side missions sometimes grants functional benefits.

Most of what you shoot in *Crysis 3* are copies of what you shot in *Crysis 2*, which is fine because Crytek's near-futuristic ballistic guns didn't need to be replaced. Instead, the number of violent bells and whistles you can attach to conventional weapons has multiplied. One of the basic rifles – the Grendel – can be mutated from a run-of-the mill M4 into a ridiculous death platform by throwing a miniature version of the Typhoon (a new SMG that spits 500 bullets per second) under the barrel as an attachment and swapping in a muzzle break to improve the accuracy of your first shot. On the receiving end of these guns, the Ceph are tamer than they were in *Crysis 2*. Stalkers are underused and Devastators, formerly the alien tanks of *Crysis 2*, fall easily. The new Ceph Scorchers are a bright spot, though: when attacked, their torso pops up like a tower shield, making them invulnerable from direct assaults.

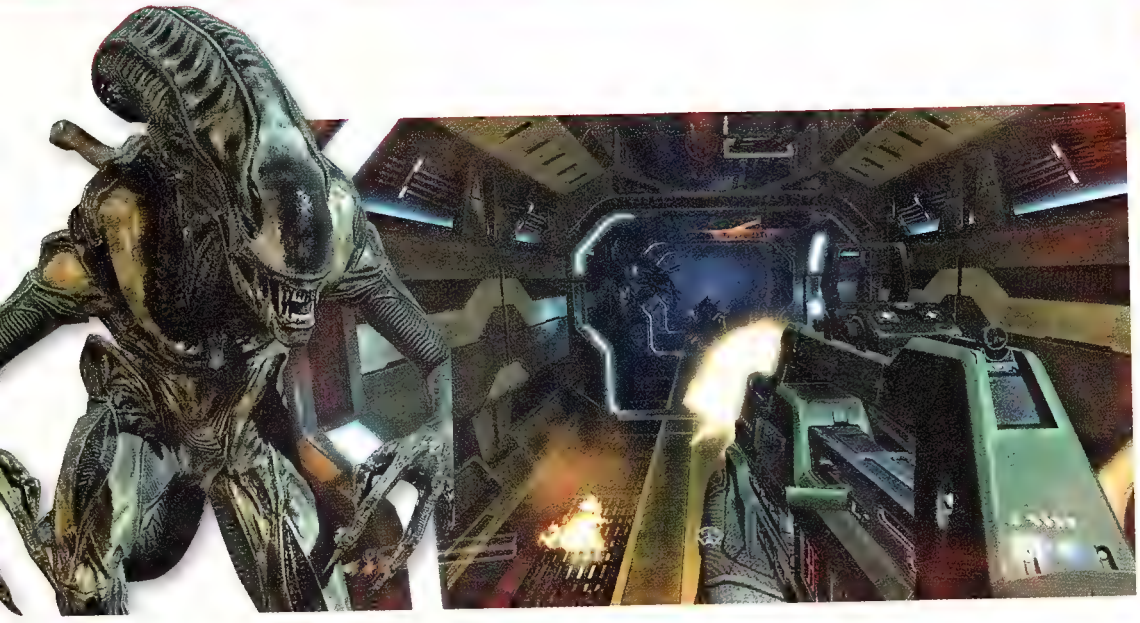
Online play feels more like a renovation than anything particularly groundbreaking, but this whole side of the game feels as affectionately made as it did in 2011. The Nanosuit's stealth and armour powers operate on two separate batteries, not a shared pool. You can cloak and then immediately activate armour mode with no penalty. This encourages a heavier use of stealth: armouring up, bagging a kill and then cloaking away is a viable getaway manoeuvre.

Crytek has played it relatively safe with *Crysis 3*. Compared with the wonderland that *Far Cry 3* drops you into, its world is low on moments and on the hours you'll spend in it – I finished it in about nine. The legacy left by *Crysis* will be much different than the craterous impact it made when it arrived in 2007. It's still a terrific, dazzling action experience with a core mechanic that empowers you, but ultimately this instalment feels more like *Crysis 2: Episode 2* than a fully-fledged sequel.

Evan Lahti

✔ Gorgeous running on the PC, multiplayer.
✖ A little too familiar to *Crysis 2*.

8/10



Aliens: Colonial Marines

Falls a long way short of being the pinnacle of evolution.

PC • 360 • PS3 • WiiU

@ www.gearboxsoftware.com/games/aliens/

$ PC, Xbox 360 and PS3 $68, Wii U $88

Late in the *Colonial Marines* campaign, you're fighting through the xenomorph-haunted hallways of Hadley's Hope with a smartgun-toting jarhead called O'Neal. He's the model of a shooter sidekick: a bottomless well of bullets and exposition who occasionally needs you to watch his back while he hacks a door. You turn a corner to see a marine being hoisted into a ventilation shaft by a xenomorph's lunging tail spike. O'Neal gasps: "What the shit was that?"

"It's an alien," you may feel like saying. "We've killed hundreds of them. Earlier I watched two of them circle you, making those adorable chittering noises." Gearbox evidently has a real love for the *Alien* films, but it's the kind of love that suffocates. Over the course of the campaign, you're dragged through meticulous recreations of the Sulaco, Hadley's Hope, the surface of LV-426 and so on.

The game's greatest desire is to show you things you've seen before, regardless of their narrative status or significance. Every now and then you get a glimpse of the systems-driven *Aliens* game that could have been. Movie-derived ideas like placing sentry guns to lock down corridors and welding doors shut arrive at predetermined moments, when they'd be far more interesting as a dynamic part of regular play. The campaign is at its best when it changes the rules. A mid-game mission sees you stripped of your weapons and stalked by a type of alien that hunts by sound, but these moments make up less than 10% of the experience, though.

Instead, *Colonial Marines* is most successful as a competitive game. Its Versus mode splits players into teams of marines and xenomorphs across four modes, from regular Team Deathmatch to Objective Capture, Survival and the *Left 4 Dead*-style Escape, where the human players must escape a long, linear stage punctuated by defence sequences. Mechanics that never cohere in the campaign come into their own when you're working with four other players.

Aliens: Colonial Marines is a deeply underwhelming game. It's neither staged carefully enough to be scary, nor dynamic enough to be exciting, and it succeeds only where other players breathe life into it. There are better linear shooters, better asymmetrical multiplayer games and better *Aliens* sequels.

Chris Thursten

✔ Versus mode manages a few scarce moments of fun.

✖ Hamstrung by poor gaming.

2/10

KNIGHTS OF PEN & PAPER

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iOS • ANDROID

I'm proud to say I used to play *Dungeons and Dragons*... Hell, I even owned a couple of my own sets of dice, so Beheld Studios' nod to the old days of paper-based gaming twanged a few heart strings. But even if you've never rolled for initiative, anyone remotely familiar with the mechanics of a turn-based RPG will find immense pleasure in plumbing the considerable depth this game has on offer. Gather together a group of virtual friends, choose classes from the classic archetypes available (rogue, cleric, mage and so on) and go on an adventure, slaying all manner of beast set upon you by the diabolically sadistic Dungeon Master. Available on both iOS and Android, there's enough content for even the most hardcore adventurer – I played a campaign for around 12 hours until my group eventually died and lacked the funds to resurrect. Fantastic.

TC

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RAZER CARCHARIAS

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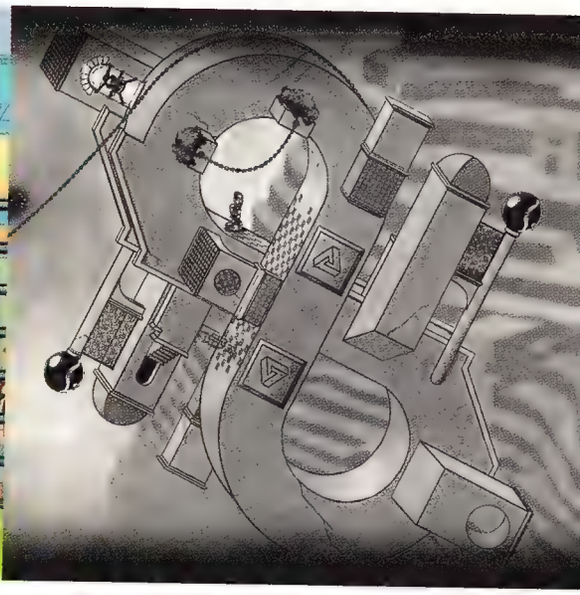
On a power and comfort to pay level, the Carcharias PC headset has always been one of my favourite headsets. It weighs nothing on the head, it's comfortable enough to wear for hours at a time, sounds great and features everything you need from a stereo headset. Yet it doesn't cost the Earth. The circumaural headset retains the same look, feel and performance as well, pumping in a few additional updates to bring it in line with today's expectations. First of these is all-gen Xbox 360 compatibility via the supplied cables. What was a lovely braided cable is now unfortunately plastic, but that's forgivable considering the additional juice the USB pulls as well as the inline volume and levelling controls, along with discreet voice controls. The sound from the 40mm drivers (20-20KHz response and 32ohm impedance) is still as good as ever, although it favours the lower end a little, but hey, it's a gaming headset. A great refresh.

TC



Scribblenauts Unlimited

Once again, the only limit is your imagination.

PC

@ www.scribblenauts.com $ PC $49.99, Wii U $69, 3DS $49

Where else can you feed cake to a fish or give a cannibal an eggplant? Only when you're playing *Scribblenauts*, of course! In the fourth game of the franchise, *Scribblenauts Unlimited* delves deeper into the backstory of returning protagonist, Maxwell. It's revealed that Maxwell was a fairly rotten kid (gasp!) and because of a cruel prank, his sister Lily has a curse placed on her so she gradually turns to stone. Maxwell plays problem-solver again, as completing tasks earns Starites, which will lift the curse.

The core gameplay is very much the same as *Scribblenauts*: someone needs help with something; for example, there's a girl who wishes for growing corn to be popped, so using Maxwell's magical notebook, you write in absolutely anything you can think of to achieve this (we invented a fire to pop the corn). What's new here is the 'unbound world' map, which adds an element of adventure exploration and the customisability of objects (3DS doesn't support this).

The degree of difficulty is generally low – we were using the adjective 'sleeping' a lot for stealth jobs and concocting many chickens and fires, as the same answer can be applied to several tasks. We were, however, genuinely stumped by a handful of puzzles (what the hell does a fudge megalodon eat?).

We've got to say, this action puzzler doesn't disappoint as it's still as fun as ever. But given we were able to finish the game in three sittings, we're not entirely sure about the long-term value.

Goldie Hong

✔ All-new unbound world, cute music, still fun.
✖ Not very challenging, not long enough.

8/10

The Bridge

It's not a PAX 10 winner for no good reason.

PC

@ www.thebridgeisblackandwhite.com $ US$14.99

When we played *The Bridge*, we found ourselves cursing a lot. And it wasn't the bad kind of cursing, it was cursing out of coolness. That's because it's, well, cool. It's a 2D puzzler dubbed as 'Isaac Newton meets M. C. Escher', so as you probably guessed, it's a testing game that utilises physics and gravity manipulation.

You start off controlling this kind of reclusive-looking fella in a suit, using A and D to walk left and right, and the arrow keys to tilt the terrain. Immediately you can sense the evident austerity; the music is eerie and aided by the game being purely in black-and-white, it gives off a film noir feel.

Each level offers a different maze, with your aim being to get to a door. You'll need to rotate the screen, often to full 360° revolutions so the ceiling becomes the floor. New elements are quickly introduced: in level 2 you need to reach a key first before planning your escape route and in level 3 there's a ball with an evil-looking face on it that must be avoided. This was where we experienced death for the first time, but it was short-lived as, in true *Braid* style, pressing down on the space bar rewinds your actions. Soon there are two keys to be attained, sometimes you have to make the keys fall to you and not the other way around, vortexes suck you in, crossing certain paths inverts the architecture... the list goes on. It's ingenious.

The attention to detail is superb, the construction of each level is impossibly unique and while you're guaranteed to get frustrated at times, you'll be left with a true sense of accomplishment once the three chapters are done and dusted.

Goldie Hong

✔ Beautiful hand-drawn art, intellectually stimulating, rewind feature.
✖ Frustrating. That's all we got.

9/10

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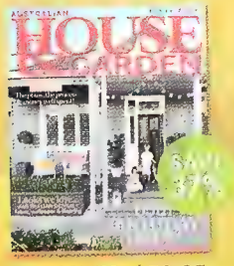

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IS STEAM EVIL?

Risking professional life and limb, Dan Griliopoulos seeks the inconvenient truth behind Valve's digital dominance.

I'm warming my hands over the fire made from the last of my furniture when my phone bings. It's an assignment! From my favourite editor! Starvation allayed for another day! Yet my face falls as I read it: 'Prove Steam is evil'. My penury means I can't refuse it, but... it's mad. Everyone knows Valve is the good guy.

No-one in their right mind could call Valve evil. We've talked to many members of the company over the years and they're a singular mix of high achievers dedicated to making the best possible games they can. Most developers I contacted refused to even contemplate the idea of Valve being evil. It's both unthinkably wrong and commercial suicide. Dan Marshall, developer of cult classic *Time Gentlemen, Please!* and forthcoming heist caper *The Swindle*, explained why: "The first problem with any argument that Steam's evil is, as anyone who has ever worked with Valve will tell you, that they're all thoroughly pleasant people who are genuinely striving to create something good."

"It's not just about good people doing a good job – it's more than that. There's a feeling of ethos that they're all trying to make something amazing, and empowering devs and gamers alike however they can. They'll tell you about the systems they're putting in place, and they'll explain why. They'll help you however they can. No, Steam's going to live or die by how popular it is. If it suddenly starts making a load of bum moves and doesn't do anything to rectify them, people will shift elsewhere. But the people I've worked with just wouldn't let that happen."

But what if there's something in Tony's mad contrariness? What if Steam, personified in its owner Valve, is evil? Or at least, could be one day? How would such a company function? How would it affect us, the gamers? What would change? Is an evil Steam the worst thing that could happen to PC gamers? We've tried to answer that on the following pages and supplied three alternate dystopias for PC gamers, if a Steam teeming with fire-eyed demons proves too ridiculous.

WHY VALVE IS GOOD

Google famously chose as its corporate slogan 'Don't be evil' and struggled to live up to it. Valve, back when it was just a nobody developer, chose the slightly less catchy 'Open your mind. Open your eyes'. Despite this mealy-mouthed aphorism, Valve has been the more generous corporation over the years, creating and popularising the digital distribution model for selling games, making it as egalitarian as it could and creating endless new ways to improve it.

Recently, after an uncommunicative hiatus, the signs are that Valve is attempting to live up to its slogan, pushing new forms of input and output to make games more exciting, innovating where the console manufacturers aren't, looking forward while others look backwards and making the PC its platform rather than Microsoft's.

The biggest change we could see to the gaming ecosystem would be if Valve – the company that owns the world's most effective digital distribution service – started acting as a real corporation, rather than a benevolent dictatorship as it does today. It's odd to think that most people in the world take 'behaving like an efficient corporation' to mean the same as 'evil', but that's reflective of most people's experience of profit-gouging corporations. Whether it's horse meat in your crispy pancakes, train tickets increasing every six months or the dangerous and expensive lie that is the global nuclear industry, consumers are used to being screwed by big companies.

So imagine how Valve might be run if it was owned by someone else; say, a Microsoft or an EA. Imagine unnecessary updates like Windows 8, feature creep, everything being charged for, thriving yet unprofitable

DYSTOPIAN ENDGAME 1

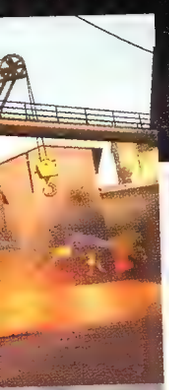
The *Warcraft* games, affectionate knock-offs of *Command & Conquer* and *Warhammer*, had a certain goofy charm. But the jump from these simple strategy titles to the world's biggest ever game, *World of Warcraft*, was a strange psychological leap for everyone except Tony.

Yet the next leap will addle even Tony's super-brain. Our next dystopian PC gaming future is that many of the next big games will be based on the old *Warcraft III* map, 'Defense of the Ancients', and that they'll all be free.

This is a bit of a late prediction, to be fair. All the existing giant MOBAs have already been based on this map – *Demigod*, *Bloodline Champions*, *League of Legends*, *Blizzard All-Stars* and *Dota 2* – with the latter three actually matching the map's layout exactly.

It's not just MOBAs. Whispers inside the big strategy game franchises say that they're looking at MOBA versions of their games, too, and given the relative simplicity and familiarity of the MOBA model (each player controlling one character, working in teams), we wouldn't be surprised to see elements of it cropping up in the multiplayer modes of other games. Bank on at least one blockbuster FPS franchise having something akin to MOBA in its next incarnation.

STEAM™

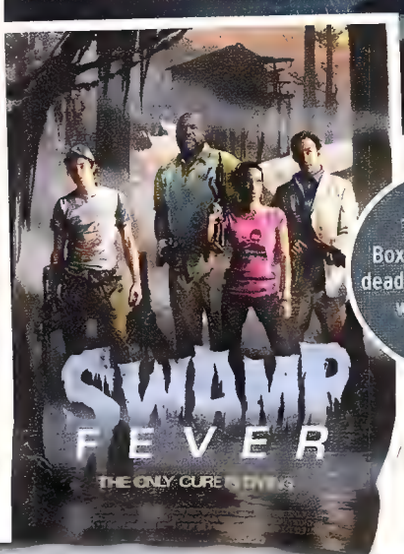


We all know that Valve is capable of producing some great games...

...though it can take its time about releasing certain sequels.

Nvidia's Project Shield should work well with Steam.

One of the best things to come out of the mod scene? We *think* so.



The Steam Box could well be dead on arrival, but we doubt it.

servers being switched off and monopolistic behaviour with cross-promoted applications.

PLAYING MONOPOLY

However, looking at the games market today, one does have to worry that it's becoming a series of walled gardens – Apple, Sony and Microsoft all have tremendous controls over their sales. On PC, the other major digital retailers sell nowhere near the number of games that Valve does and Steam is turning the PC into Valve's own walled garden. The company has a virtual monopoly on the discoverability and community aspects of gaming, such as social networks, gifting, modding, multiplayer and promotion. Having this much power concentrated in one spot can't be good for the consumer, can it?

These intimations of Valve becoming a monopoly don't worry Marshall. "Having a monopoly isn't necessarily a bad thing – when all the systems at play work well together, a monopoly can be pretty damned useful for the end user. If I organise a meeting over Gmail, it's automatically put into my Google Calendar and my Nexus7 tells me what the weather's going to be like when I get there. It's brilliant! Anyone who's tried to use iTunes on Windows can tell you that having more than one set of fingers jabbing at a service can really mess it up." Similarly, anyone trying to construct a replacement Steam will understand why one company controlling everything isn't always a bad thing.

Admittedly, Valve doesn't quite have a monopoly over the PC gaming market, but it's very close. To have a real monopoly a company needs to control the price of its products and it needs to have a significant, relevant market share so that consumers have no choice but to buy its product.

Regarding market share, anecdotal evidence from developers has Steam selling more than 10 times the rest of digital retail put together. Yet consumers are still price-mobile – if they find a game cheaper elsewhere than it is on Steam (such as a developer's own site), they can buy it there. However, consumers mostly don't as the other facets of Steam – community, fast downloads, auto-patching, mods, easy DLC and so on – mean a discount isn't as valuable as it seems, relative to the functionality that's been lost. Moreover, games are often cheaper on Steam, especially older ones.

So Steam has pretty near 100% of the market for PC gamers, but is it controlling prices? No. As far as we can tell, it takes a percentage of all revenues, altered depending on the developer's leverage – Activision gives less, an indie would give more. The price is set by the developer or publisher of the game, unlike Microsoft's XBLA, for example, with its set price points ($5, $10 or $20), or Amazon, which once forced certain developers to give their apps away for free on its marketplace. Valve itself says: "Pricing is very title specific, and we've got a lot of data and experience to help you decide on what the best price is for your title. We'll work with you to figure out pricing." This means we can't classify Steam as a monopoly until it has price controls. Is there really a threat here?

GOODBYE, GABE

Well, yes. What happens if the ownership moves to someone... evil? Valve is owned privately, mainly by one man: the angelic Gabe Newell. A one-time producer on 'the first three versions of Windows', Newell was one of approximately 12,000 early Microsoft employees who cashed out their stock options in 1996, after they'd increased in value a hundredfold. Newell is rumoured to have walked away with half a billion dollars. It was he and fellow Windows programmer Mike Harrington who, with the encouragement of id's John Carmack and Michael Abrash, decided it was time for a new, clever PC gaming company and put their windfall into founding Valve in 1996. Harrington sold out in 2000, leaving Gabe in sole control of the company.

If Gabe Newell sells out or passes away, or is forced into a sale by legal action or personal financial problems, this might happen (though the latter is unlikely, given his $1.5 billion fortune). We've seen companies sell out that we never thought would, that seemed financially secure – id Software, BioWare and Bullfrog, for example. There's no reason to think Valve couldn't go that way too.

So how would an evil Steam change its behaviour on price? Well, the company has most developers (especially indies) over a barrel, so it's likely it would renegotiate profit shares with them and probably also

DYSTOPIAN ENDGAME 2

This might sound like a utopia, but the best dystopias always do. Games are currently becoming pervasive; it's well known that the average gamer these days is a 40-year-old mother of two. Facebook took games to the masses, but they got bored of *FarmVille* fast and moved on. My hairdresser is a grandmother in her late 50s, but she plays *Diablo III* and *World of Warcraft* in between cutting heads. At the other end, gamification is being used by large corporations to manage their staff. Games will be everywhere.

"But," you cry, in your rich baritone, "we'll still want to play on PC!" We've talked before about the new game streaming tech and how it's just waiting for network speeds to be fast enough; why play on PC, when you can play anywhere?

More importantly than that, tablets are already running at higher resolutions than most PC monitors, which are approaching the speeds of desktops and are cheaper as well, since they've mostly disposed of the bloatware that is Windows. What remaining advantages will a PC have when other devices are faster, are easier to use and have a wider range of games on them?

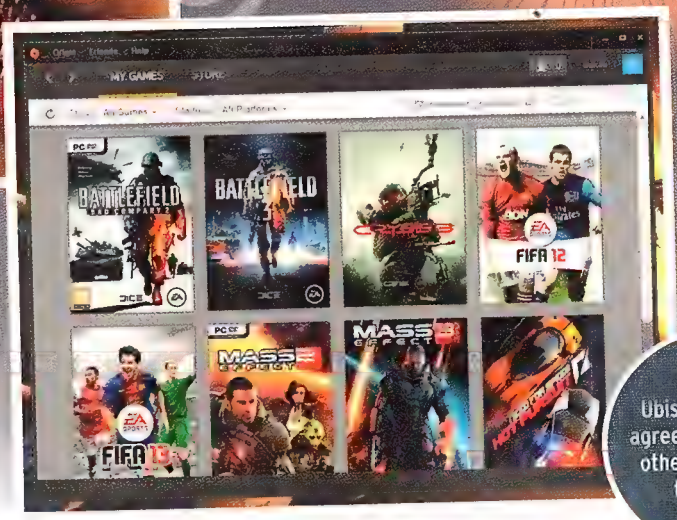
Notably, Gabe Newell himself is sceptical of this dystopia, as he said in his keynote speech at the recent DICE conference: "Cloud gaming works until it starts to be successful – at which point, it falls over. All the spreadsheets ignore the producing levels that consumer networks use. When everyone starts using a continuous network connection in order to get their applications, prices are going to go through the roof."

Essentially, because networks can't deal with this traffic, streaming tech will never work. Newell's solution is familiar to Microsoft Media Center users: a PC in the home, streaming to all devices over a local network. "I think there's a place for cloud gaming, but more as a feature or for things like demos and spectating. But not as core architecture."

Whatever the Steam Box ends up looking like, it'll be interesting.

The Swindle is the next game from Dan Marshall and will probably appear on Steam.

Gabe Newell worked for Microsoft before starting Valve.



EA and Ubisoft recently agreed to sell each other's games in their own estores.

DYSTOPIAN ENDGAME 3

Remember prohibition? Probably not first hand, so let us recap for you. In the 1920s, America banned alcohol as a highly addictive antisocial substance, with the support of the vast majority of the population, but oddly against the wishes of a substantial minority of non-drinkers. If games are shown to be clinically problematic, gamers could face a similar fate.

The mechanism for this may come from the next DSM – the American Psychiatric Association's classification tool for mental illness. The latest DSM-5 (just released as a draft) says that more research is needed on games addiction, although the next one will likely include recent studies showing that internet usage and video games (particularly online gaming) are highly addictive, on a level comparable to cocaine, amphetamines and such like.

If games are shown to be addictive in this way, we predict that legislators will make access to them more limited, especially to children. Would you let your child use something that's been proved to be highly addictive, even as a gamer yourself? Like cigarettes and alcohol, a balance will be struck, with age ratings on games taking into account not just moral issues (sex and violence), but also the likelihood of addiction.

Game developers, especially those developing for children, will have to think much harder about how to avoid compulsion-based gaming mechanics if they want younger players to be allowed to play their games. Online games in particular have already been tarred with names like *EverCrack* and implicated in deaths, crime and murder. It's most likely that these will face the heaviest brunt of any future regulation.

renegotiate control over price. Once Steam can alter the price of products, it can raise prices to maximise its profits, even at the expense of developers. It might also mean more regional inequality, more incidental charges and more price-gouging in other areas, but that's unlikely because Valve knows how vocal its community is and how fast they'll move if there are problems. The developers are the ones who will lose out as they can't afford to move away.

How else could Valve be evil? Could it introduce DRM? Well, Steam already has that, in the form of its always-on connection; you can play in an offline mode, but the tech is old, clunky and requires setting up. You can't play your games on more than one computer at the same time.

Is it silly to be scared of losing access to all our games? Well, software developers do change their terms of service. Ask anyone in the UK who bought the original Guardian iOS app, which promised unlimited access to *The Guardian* newspaper forever for a small fee. *The Guardian* discontinued it a year later. Valve is extremely unlikely to do this, but if it goes bust, as unlikely as that is, we'll lose access to all those games we think we own. At least Direct2Drive and Good Old Games give you the entire DRM-free installer for any game you buy from them. Steam games simply won't work without that always-on connection.

Meanwhile, the way Steam links games to accounts and prohibits the sale of accounts precludes any ability to sell on games, despite the tech being trivial for Valve itself (as evinced by the ability to 'gift' games on the system). While I was writing this piece, a German consumer rights agency instigated legal action against Valve because of this. Simply put, in terms of consumer rights as dictated by the normally business-friendly courts, Valve is already acting like it's evil.

This highlights that the real problem with the evil Valve concept isn't that it's unlikely, it's that it wouldn't make that much difference to the end user, because evil Valve isn't stupid Valve.

Today's Valve isn't saintly Valve either – it's much more human. It simply isn't going to do anything that threatens its ability to do what it wants to: make and evangelise great games. Developers would see their Steam profits diminish, but the external market is fairly healthy these days and Valve is still the best place to market PC games of any type.

How would an evil Valve affect the Steam Box? Well, some games might end up as Steam Box exclusives; for example, big-name indie games or Valve's own titles. At the moment, Valve says: "We think you should get your game in front of as many people as you can, therefore we do not require exclusivity on titles". Again, making any games Steam Box exclusives is unlikely, as it would damage the most profitable part of the business and doesn't fit with Steam as a platform-agnostic system. It might be that Valve behaves more like a business, forcing developers who want to be on Steam to support the Steam Box's biometrics, but again, this would be good for consumers.

GOODY TWO SHOES

Despite our worries, we're aware that this is rampant speculation. We expect that Gabe, one of the cleverest, wisest men in computing, has put elements in place so that Valve continues once he's gone. The team he'll leave behind, through strict hiring policies and a flat internal hierarchy, is the most creative, well-intentioned and talented anywhere in games. When Chet Faliszek, one of Valve's writers, tells us that "I hear, see, and speak no evil," we're inclined to believe him.

So what future do we really see for Valve? Well, we think the Steam Boxes will be extremely disruptive, particularly the mid-range 'Better' Box, which will act as a replacement for the next-gen consoles (PS4 and Xbox 720). Looking at how Steam has progressed from something that had us all digitally queuing for two days to play *Half-Life 2* to an ultra-efficient free gaming platform that's the fourth biggest consumer of data in the world, we know that when Valve tries something, it might not be right first time, but it will be polished until it's perfect. And it will listen to its users while it works on it. Given its record, we expect its eventual reveal of its future tech and *Half-Life 3* will go hand in hand and will be truly stunning; however, we won't see it until it's ready and it won't be hurried by anyone. APC

chipchat

PETER DOCKRILL

IDENTITY CRISIS

The iPhone is a household name for something that well and truly changed the course of mobile tech history, but the nomenclature wasn't always so cut and dried. Former Apple ad man Ken Segall recently revealed that a number of names were originally tossed around for Apple's iconic smartphone. Among them: 'Telepod', 'Mobi' and 'Tripod', and even a second-time-lucky 'iPad' was once in contention. We can't help but wonder what the world would be like now if Apple had settled on the delightfully geeky 'Telepod'...

CLOUD VS. CLOUD

In the world of online storage providers, it seems all clouds are equal... although some clouds are *more equal* than others. Dropbox CEO Drew Houston recently spoke out against arch-rival Apple's iCloud, warning users against the perils of getting stuck in a proprietary, closed-off storage ecosystem that makes it pretty darn hard to easily sync files between, say, an iPad and an Android phone. A point well observed. Of course, he also went on to say: "Apple and Google will take their platforms and converge them", but we're inclined to think that rosy future might still be a little while away.

STRANGE BEDFELLOWS

Korean technology. The phrase might be synonymous with South Korean hardware heavyweights Samsung and LG, but now another organisation could be muscling in on their turf: The Pirate Bay. The beleaguered peer-to-peer piracy collective recently announced it was setting up shop in neighbouring North Korea, of all places, to use Pyongyang's internet network as its BitTorrent backbone. Largely seen as a bizarre publicity prank (and later admitted as a hoax), the unlikely claims show those persecuted pirates still have a healthy sense of humour.

POLITICALLY INCORRECT

Twitter is celebrated as being the hyper-chatty mouthpiece of the world, but to what extent does the tweet's next accurately reflect most people's views? A year-long study of the social network by the US-based Pew Research Center, *Twitter Reaction to Event Often at Odds with Overall Public Opinion*, found that the tone of Twitter's 'conversation' veered sharply around different political events, alternating between overly liberal views at times while at others tending heavily to the conservative. Pew's conclusion: Twitter's youthful user base is not to be confused "with the overall reaction of adults nationwide". apc

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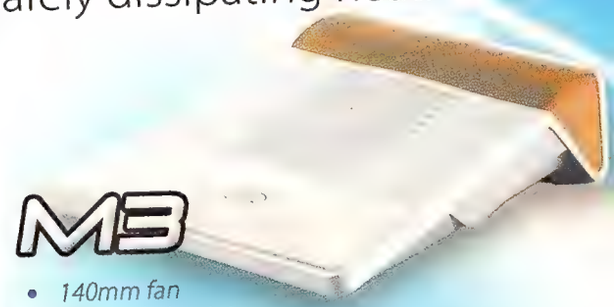

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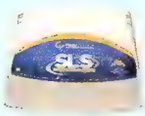

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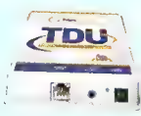

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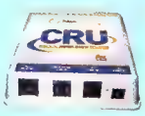

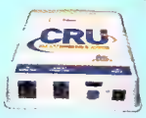

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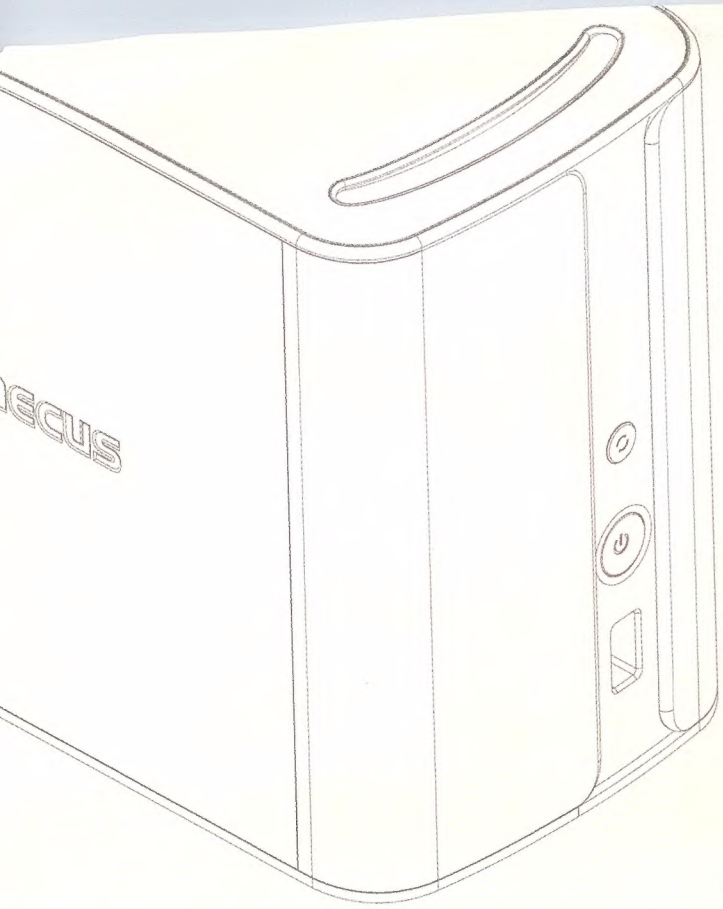

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